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THE
AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA
FOR PROMOTING USEFUL KNOWLEDGE

YEAR BOOK 1942

JANUARY 1, 1942 – DECEMBER 31, 1942

THE AMERICAN PHILOSOPHICAL SOCIETY
INDEPENDENCE SQUARE
PHILADELPHIA
1943

LANCASTER PRESS, INC., LANCASTER, PA.

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I

CHARTER *

STATUTES AT LARGE OF PENNSYLVANIA

CHAPTER DCCCXCIV.

AN ACT

for incorporating the American Philosophical Society held at Philadelphia for promoting useful knowledge.

L. S.

Whereas the cultivation of useful knowledge, and the advancement of the liberal arts and sciences in any Country, have the most direct tendency towards the improvement of agriculture, the enlargement of trade, the ease and comfort of life, the ornament of society, and the encrease and happiness of mankind; **And whereas** this country of North America, which the goodness of Providence hath given us to inherit, from the vastness of its extent, the variety of its climate, the fertility of its soil, the yet unexplored treasures of its bowels, the multitude of its rivers, lakes, bays, inlets, and other conveniences of navigation, offers to these United States one of the richest subjcts of cultivation, ever presented to any people upon earth; **And whereas** the experience of ages shows that improvements of a public nature, are best carried on by societies of liberal and ingenious men, uniting their labours, without regard to nation, sect or party, in one grand pursuit, alike interesting to all, whereby mutual prejudices are worn off, a humane and philosophical spirit is cherished, and youth are stimulated to a laudable diligence and emulation in the pursuit of wisdom; **And whereas**, upon these principles,

* Original Charter, Granted in 1780. Articles of Amendment added 1935.

divers public-spirited gentlemen of Pennsylvania and other American States did heretofore unite themselves, under certain regulations, into one voluntary Society, by the name of "The American Philosophical Society held at Philadelphia, for promoting useful knowledge," and by their successful labours and investigations, to the great credit of America, have extended their reputation so far, that men of the first eminence in the republic of letters in the most civilized nations of Europe have done honour to their publications, and desired to be enrolled among their members; **And whereas** the said Society, after having been long interrupted in their laudable pursuits by the calamities of war, and the distresses of our Country, have found means to revive their design, in hopes of being able to prosecute the same with their former success, and being further encouraged therein by the public, for which purpose they have prayed us, "the Representatives of the Freemen of the Commonwealth of Pennsylvania," that they may be created One Body Politic and Corporate forever, with such powers, privileges, and immunities, as may be necessary for answering the valuable purposes which the said Society had originally in view.

Wherefore, in order to encourage the said Society in the prosecution and advancement of all useful branches of knowledge, for the benefit of their country and mankind.

[SECTION I.] **Be it enacted, and it is hereby enacted by the Representatives of the Freemen of the Commonwealth of Pennsylvania, in General Assembly met, and by the authority of the same,** That the Members of the said American Philosophical Society heretofore voluntarily associated for promoting useful knowledge, and such other persons as have been duly elected Members and Officers of the same, agreeably to the fundamental laws and regulations of the said Society, comprized in twelve sections, prefixed to their first volume of transactions, published in Philadelphia by William and Thomas Bradford in the year of our Lord one thousand seven hundred and seventy-one, and who shall in

all respects conform themselves to the said laws and regulations, and such other laws, regulations and ordinances, as shall hereafter be duly made and enacted by the said Society, according to the tenor hereof, be and forever hereafter shall be, One Body Corporate and Politic in Deed, by the name and style of "The American Philosophical Society held at Philadelphia, for promoting useful knowledge," and by the same name they are hereby constituted and confirmed One Body Corporate and Politic, to have perpetual succession, and by the same name they and their successors are hereby declared and made able and capable in law, to have, hold, receive, and enjoy lands, tenements, rents, franchises, hereditaments, gifts, and bequests of what nature so ever, in fee simple or for term of life, lives, years or otherwise, and also to give, grant, let, sell, alien, or assign the same lands, tenements, hereditaments, goods, chattels, and premises, according to the nature of the respective gifts, grants, and bequests, made to them the said Society, and of their estate therein. **Provided**, that the amount of the clear yearly value of such real estate do not exceed the value of ten thousand bushels of good merchantable wheat.

[Section II.] **And be it further enacted by the authority aforesaid**, That the said Society be, and shall be for ever hereafter able and capable in law to sue, and be sued, plead and be impleaded, answer and be answered unto, defend and be defended in all or any of the courts or other places, and before any Judges, Justices, and other person or persons, in all manner of actions, suits, complaints, pleas, causes, and matters, of what nature or kind so ever, within this Commonwealth; and that it shall and may be lawfull to and for the said Society, for ever hereafter to have and use one common seal in their affairs, and the same at their will and pleasure to break, change, alter and renew.

[Section III.] **And be it further enacted by the authority aforesaid**, That for the well governing of the said Society, and ordering their affairs, they shall have the following officers, that is to say, one Patron, who shall be his

Excellency the President of the Supreme Executive Council * of this Commonwealth, for the time being, and likewise one President, three Vice Presidents, four Secretaries, three Curators, one Treasurer, together with a Council of twelve members; and that on the first Friday of January next, between the hours of two and five in the afternoon, as many of the members of the said Society as shall have paid up their arrears due to the Society, and shall declare their willingness to conform to the laws, regulations and ordinances of the Society then duly in force, according to the tenor hereof, by subscribing the same, and who shall attend in the Hall or place of meeting of the said Society, within the time aforesaid, shall chuse by ballot, agreeable to the fundamental laws and regulations herein before referred to, one President, three Vice Presidents, four Secretaries, three Curators, and one Treasurer, and at the same time and place, the members met and qualified as aforesaid shall in like manner chuse four members for the Council, to hold their offices for one year, four more members for the Council to hold their offices for two years, and four more members for the Council, to hold their offices for three years. And on the first Friday in January, which shall be in the year of our Lord one thousand seven hundred and eighty-two, and so likewise on the first Friday of January, yearly and every year thereafter, between the hours of two and five in the afternoon, the Members of the said Society met and qualified as aforesaid, shall chuse one President, three Vice Presidents, four Secretaries, three Curators and one Treasurer, to hold their respective offices for one year, and four Council Men to hold their offices for three years, *Provided* that no person residing within the United States shall be capable of being President, Vice President, Secretary, Curator, Treasurer, or member of the Council, or of electing to any of the said offices, who is not capable of electing and being elected to civil offices within the State in which he resides. *Provided also*, that nothing herein

* [Now His Excellency the Governor of this Commonwealth.]

contained shall be considered as intended to exclude any of the said Officers or Councillors, whose times shall be expired, from being re-elected, according to the pleasure of the said Society; and of the day, hours and place of all such elections, due notice shall be given by the Secretaries, or some one of them, in one or more of the public newspapers of this State, agreeable to the said fundamental laws and regulations before referred to.

[Section IV.] **And be it further enacted by the authority aforesaid,** That the Officers and Council of the said Society shall be capable of exercising such power for the well governing and ordering the affairs of the Society, and of holding such occasional meetings for that purpose, as shall be described, fixed, and determined by the statutes, laws, regulations and ordinances of the said Society, hereafter to be made. *Provided always,* that no statute, law, regulation or ordinance shall ever be made or passed by the said Society, or be binding upon the members thereof, or any of them, unless the same hath been duly proposed, and fairly drawn up in writing, at one stated meeting of the Society, and enacted or passed at a subsequent meeting at least the space of fourteen days after the former meeting, and upon due notice in some of the public newspapers, that the enacting of statutes and laws, or the making and passing ordinances and regulations, will be part of the business of such meeting; nor shall any statute, law, regulation or ordinance be then or at any time enacted or passed, unless thirteen members of the said Society, or such greater number of members as may be afterwards fixed by the rules of the Society, be present, besides such quorum of the Officers and Council, as the laws of the Society for the time being may require, and unless the same be voted by two-thirds of the whole body then present; all which statutes, laws, ordinances and regulations, so as aforesaid duly made, enacted and passed, shall be binding upon every member of the said Society, and be from time to time inviolably observed, according to the tenor and effect thereof; pro-

vided they be not repugnant or contrary to the laws of this Commonwealth, for the time being in force and effect.

And whereas nations truly civilized (however unhappily at variance on other accounts) will never wage war with the Arts and Sciences, and the common Interests of humanity:

[SECTION V.] **Be it further enacted by the authority aforesaid,** That it shall and may be lawful for the said Society by their proper officers, at all times, whether in peace or war, to correspond with learned Societies, as well as individual learned men, of any nation or country, upon matters merely belonging to the business of the said Society, such as the mutual communication of their discoveries and proceedings in Philosophy and Science; the procuring books, apparatus, natural curiosities, and such other articles and intelligence as are usually exchanged between learned bodies, for furthering their common pursuits; **Provided always,** That such correspondence of the said Society be at all times open to the inspection of the Supreme Executive Council of this Commonwealth.

[Signed] *JOHN BAYARD,*
Speaker.

Enacted into a Law at Philadelphia on Wednesday the fifteenth day of March anno Domini one thousand seven hundred and eighty.

[Signed] *THOMAS PAINE,*
Clerk of the General Assembly.

COMMISSION FOR THE COMPILATION OF THE LAWS OF PENNSYLVANIA PRIOR TO 1800.

CLERK'S OFFICE,
1211 BETZ BUILDING.

JAMES T. MITCHELL, HENRY FLANDERS, } *Commissioners.* CHAS. R. HILDEBURN, *Clerk.*

PHILADELPHIA, March 12, 1898.

Compared, revised and found to be a correct copy of the original enrollment in the archives of the Commonwealth, by me the custodian of the said original as clerk of the commissioners appointed under the act of May 19, 1887, entitled, AN ACT FOR THE COMPILATION AND PUBLICATION OF THE LAWS OF THE PROVINCE AND COMMONWEALTH OF PENNSYLVANIA PRIOR TO THE YEAR ONE THOUSAND EIGHT HUNDRED, P.L. 1887, pp. 129 and 130.

CHAS. R. HILDEBURN,
Clerk of the Commissioners.

Witness as to Chas. R. Hildeburn:

WM. NEWBOLD ELY,
JULIUS F. SACHSE.

SEAL Sworn to and subscribed before me this 19th day of May, 1898.

JAMES P. STERRETT,
Chief Justice of the Supreme Court of Pennsylvania.

ARTICLES OF AMENDMENT

Article I

Notwithstanding the Proviso at the end of the first paragraph following the preamble of this Charter, or any other proviso thereof, the Society shall have the capacity and authority without limitation by this Charter to purchase, take, receive, lease as lessee, take by gift, devise or bequest, or otherwise acquire, and to own, hold, use, and otherwise deal with any and all real or personal property, or any interest therein, wherever situated.

Article II

Any provisions of this Charter which are purely administrative in their nature, including those concerning the officers, the members of the council, and the date and time of meetings, may be altered by a law, regulation or ordinance of the Society duly adopted and not repugnant or contrary to the laws of this Commonwealth.

CERTIFICATE OF ACCEPTANCE

1. The name of the accepting corporation is The American Philosophical Society held at Philadelphia for promoting useful knowledge.
2. The American Philosophical Society was created by the Act of Assembly approved March 15, 1780, L.B. No. 1, 363.
3. The American Philosophical Society herewith accepts the Constitution of Pennsylvania and the provisions of the Nonprofit Corporation Law.
4. The acceptance made herewith was duly authorized by a meeting of the members called for that purpose, held in Philadelphia on the 6th day of December, 1935.

Roland S. Morris
President

C. F. Skinker
Assistant Secretary

SEAL Filed this 12th day of December, 1935
J. Warren Mickle
Deputy Secretary of the Commonwealth

Recorded in
Miscellaneous Corporation
Record Book 210, P. 125

II

LAWS

(As Amended April 24, 1936, April 22, November 19, 1938, November 18, 1939, and November 21, 1942)

Chapter I

Of the Members both resident and foreign: their classification, nomination, and election; suspension and forfeiture of membership.

Art. 1. The resident members of the Society are elected from among citizens or residents of the United States who have achieved distinction in the sciences or humanities, in letters, in the practice of the arts or of the learned professions, or in the administration of affairs. Their number may not exceed five hundred, nor may more than thirty be elected in any one year.

Art. 2. The foreign members of the Society are elected from among persons who are neither citizens nor residents of the United States, and who are of the greatest eminence for their attainments in science, letters, or the liberal arts. Their number may not exceed sixty, nor may more than eight be elected in any one year.

Art. 3. Every member, whether resident or foreign, shall be classified according to his expressed wishes, or in accordance with his principal activities or contributions to knowledge, in one of the following four classes: *

* In accordance with general usage, the following more or less clearly defined fields of science and learning within the four classes have been recognized by the Society in recent years: Class I. Mathematics; Astronomy; Physics; Chemistry; Engineering. Class II. Geology, Paleontology, Geography; Zoology, Anatomy; Botany, Bacteriology; Anthropology, Psychology; Physiology, Pathology; Medicine, Pharmacology, Surgery. Class III. Political Science, Economics, Statistics and Sociology; Modern History; Jurisprudence; Administration, Government; Affairs. Class IV. Philosophy, Education; Ancient, Medieval and Cultural History; Archaeology, History of Art, Architecture; Literary History; Languages; Letters, Fine Arts.

Class I. Mathematical and Physical Sciences
Class II. Geological and Biological Sciences
Class III. Social Sciences
Class IV. Humanities

ART. 4. In each of the four classes of members there shall be a Committee on Membership consisting of a Chairman and four other members, appointed by the President.

ART. 5. Nominations to membership shall be made in writing by the Committees on Membership, or they may be made by any five members of the Society. These nominations shall be known respectively as "Committee nominees," and "Member nominees," and shall be so listed in the *preliminary ballot.* These nominations must be in the Executive Office before December first. Nominations shall be on blank forms provided for that purpose and shall specify the qualifications and principal activities or fields of learning of the nominees. In case of non-election nominations may be continued by the written endorsement of three of the proposers filed in the Executive Office before November first following and shall be listed as "Continued nominations" in the *preliminary ballot;* these nominations may be continued a second time in similar manner, after which the names of the unsuccessful candidates will be dropped and all papers relating thereto destroyed. Such candidates may be considered again only by entirely new nominations.

ART. 6. Immediately after December first in each year the Chairman of each Committee on Membership shall submit to the members of his class a list of all the nominations in the class and shall request them to use this list as a *preliminary ballot* and to check on it the names of those persons, not more than twelve in number, whom they prefer for resident members, and not more than five whom they prefer for foreign members, and to sign and return this ballot to the Executive Office before January first.

ART. 7. Before February first each Committee on Membership shall select from among those nominees having a

high number of votes in the *preliminary ballot* not more than twelve for resident membership and not more than five for foreign membership in each class, due regard being given to a proper representation of the various subjects within the class.

Art. 8. Before February first, the Council may nominate not more than three persons in each year whose names shall be presented to the Society in the *preference ballot* as "Council nominees" together with their qualifications. These nominations shall be on the regular blank forms provided for that purpose.

Art. 9. It shall be the duty of each Committee on Membership to prepare, with such outside assistance as it may choose, a brief biographical sketch of each of the nominees so selected, listing his profession, position, qualifications, and important publications or contributions to science, literature, art or affairs. The names of these nominees, together with the biographical sketch of each, shall then be printed in alphabetical order under each class, and shall be sent confidentially to all members of the Society not later than March first. Members shall be invited to return to the Executive Office before April first a *preference ballot* on which they have checked the names of not more than thirty nominees for resident membership and of not more than eight for foreign membership.

Art. 10. The Council at the meeting next preceding the General Meeting of the Society in the month of April, notice of which shall be given at least two weeks in advance, shall select by ballot from the list of nominees residing within the United States a number not exceeding thirty, and of non-residents of the United States a number not exceeding eight, to be recommended to the Society for election. In this selection special weight shall be given to the votes of members in the preference ballot. The names of the nominees so chosen, arranged alphabetically in classes, shall be reported to the Society at its next ensuing session.

Art. 11. Election to membership, both resident and foreign, shall be by ballot at the General Meeting of the Society in the month of April. A two-thirds vote of those present and voting shall be necessary to elect.

Art. 12. The members are mutually pledged not to mention to non-members of the Society the name of any nominee proposed, or of any withdrawn or unsuccessful nominee.

Art. 13. Every person who is elected a resident or foreign member shall signify his acceptance in writing within one year after the mailing of notification of such election. In default of such acceptance the election shall be void.

Art. 14. The formal admission of a member into the Society shall be at his first attendance at a meeting of the Society after his election and in the manner and form following: He shall subscribe the Laws in the Roll Book and be introduced to the President, who, taking him by the hand, shall say:

"By the authority and in the name of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge, I do admit you a Member thereof."

Art. 15. The Society may from time to time assess membership dues in accordance with its needs and policies. Any person who shall refuse or neglect to pay such assessment for two years, after two or more notifications from the Treasurer, shall be reported to the Society as delinquent and his name shall be stricken from the roll of members.

Art. 16. The membership of any resident or foreign member may, for good and sufficient cause, and upon recommendation by the Council, be terminated by the Society at a General Meeting by a vote of two-thirds of the members attending, provided, however, that the total number of members so attending shall be not less than thirty.

Chapter II

Of the Patron and Elective Officers; qualifications, nominations and elections, terms of office, suspension or removal, vacancies.

Art. 1. The Governor of Pennsylvania shall be ex-officio the Patron of the Society.

Art. 2. The elective Officers of the Society shall be a President, three Vice-presidents, two Secretaries, a Curator, a Treasurer, and twelve Councillors.

Art. 3. No person save the Treasurer, who may be a Corporation, shall be capable of holding any elective office as defined above, who is not a citizen of the United States.

Art. 4. Nominations to the elective offices of the Society are made by the Committee on Nominations as hereinafter provided, and may also be made by petition signed by not less than twenty members, in such manner as may be prescribed by the Committee on Nominations and approved by the Council.

Art. 5. The election of Officers shall be held at the General Meeting in the month of April at a time duly announced in the program. The election shall be by ballot, a majority of all ballots cast being requisite for election. In the event that no candidate for a given office shall receive such a majority, a second ballot shall be taken and election shall be by plurality of votes cast.

Art. 6. The terms of all elective Officers, except Councillors, are of one year, commencing upon the close of the General Meeting at which they are elected. They shall serve until the election and acceptance of their successors and are eligible for reelection.

Art. 7. The terms of Councillors are of three years, commencing upon the close of the General Meeting at which they are elected. They shall serve until the election and acceptance of their successors, but are ineligible for reelection until one year after the expiration of their terms of office.

ART. 8. Any elective Officer may be suspended or removed from office, for good and sufficient cause, at a meeting of the Council, by a vote of two-thirds of all its members.

ART. 9. A vacancy occurring in any elective office may be filled for the unexpired term by vote of a majority of the Council.

CHAPTER III

Of the Officers and their duties

ART. 1. The PRESIDENT shall preside at the meetings of the Society and Council; he shall appoint all committees, and designate their chairmen, except as otherwise provided in the Laws, and shall be ex-officio a member of all committees except the Committee on Nominations.

ART. 2. The VICE-PRESIDENTS shall preside at meetings of the Society and Council, in the absence of the President, in rotation in order of seniority of continuous service. In the event of the death or disability of the President, the senior Vice-president shall act as President until the vacancy shall be filled.

ART. 3. The SECRETARIES shall have the custody of the Seal of the Society, shall record the proceedings of the Society and the Council, shall notify all acts of the Society and the Council to those concerned, shall conduct the correspondence of the Society and Council, shall maintain the authentic list of resident and foreign members, and shall have the custody of the Society's files and records. The Secretaries shall arrange among themselves each year as to the distribution and performance of their duties, and shall report such arrangement to the Council; they shall also have power to delegate the performance of their duties to the Assistant Secretary or Executive Officer.

ART. 4. The CURATOR shall have charge of the Cabinet, and shall supervise the maintenance, exhibit, and use of the Society's collections, and shall advise the Council with

respect to their increase, disposal, or temporary loan. He shall be ex-officio a member of the Committee on the Hall.

ART. 5. The TREASURER may be a person, as defined in Chap. II, Art. 3, or a trust company or other suitable financial corporation of the State of Pennsylvania. He shall collect and receive all moneys due or payable to the Society or entrusted to its care, and all gifts and bequests made to it. He shall pay all bills due by the Society when properly approved, in accordance with appropriations authorized by the Society or the Council, or in accordance with the terms of trust funds established for specific purposes. He shall deposit the funds and securities of the Society in its name with such banks or trust companies in the State of Pennsylvania as may be approved by the Committee on Finance.

ART. 6. The Treasurer shall keep accounts in good and regular order of all receipts and expenditures and of all moneys or other property in his hands, and shall report them, and present them for audit, as may be required by the Committee on Finance.

ART. 7. The Treasurer may, if authorized by vote of the Committee on Finance, employ an assistant treasurer or a trust company or other suitable financial corporation of the State of Pennsylvania, approved by the Committee on Finance, for the performance of such duties as may be delegated to such agent.

ART. 8. The Treasurer shall give bond, at the expense of the Society, for the faithful execution of all his trusts, in such amount as may be required by the Committee on Finance.

ART. 9. The Treasurer shall, upon the expiration of his term of office, deliver over to the Committee on Finance, for transmittal to his successor, the books, papers, moneys, and property remaining in his hands.

Chapter IV

Of the Council and the Annual Budget

Art. 1. The Council shall consist of the Officers, the twelve Councillors, and the Chairmen of the Committees on Finance, Research, Publications, Library and Hall.

Art. 2. The Council shall hold at least two meetings a year, and nine members shall constitute a quorum at any meeting, provided, however, that for the adoption of the budget a vote of a majority of all the members shall be requisite. Minutes of the proceedings and acts of the Council shall be regularly kept.

Art. 3. The Council shall make recommendations for membership in the Society as provided in Chap. I, Art. 9, of the Laws, and elect members of the Committees on Research and Publications as provided in Chap. 5, Arts. 5 and 8.

Art. 4. The Council shall, at such time as they may fix, ask all Committees to submit estimates of their needs for the ensuing fiscal year which, together with the report of receipts and expenditures by the Committee on Finance, shall be made the basis for the annual budget to be submitted by the Council to the Society for its approval at the General Meeting in April or November.

Art. 5. The Council shall have power to take action for the Society in legal matters, to manage its affairs, and to assume its administration, to make contracts or to authorize them to be made in the name of the Society, except as otherwise provided.

Art. 6. The Council shall require reports to be presented to it at least once a year by such officers, committees, and employees of the Society as they may designate, or as may be required by the Laws to present such reports, and shall, through the President, present an annual report to the Society on the state of its affairs.

Art. 7. The Council shall have power to appoint an administrative Executive Officer, and to fix his term of service, duties and compensation.

Chapter V

Of the Committees of the Society

Art. 1. There shall be four Committees on Membership, one in each class, each composed of five members whose appointment and duties are prescribed in Chap. I, Arts. 4–8.

Art. 2. There shall be a Committee on Finance, consisting of the President and Treasurer, ex-officio, and not fewer than five other members who shall be nominated by the President and elected by the Society at the General Meeting in April. A majority of the Committee shall constitute a quorum at any meeting. The Committee shall keep a record of all its acts and proceedings, which shall be communicated to the Council.

Art. 3. The Committee on Finance shall have the general superintendence of the financial concerns of the Society. It shall have the custody and control of all the securities and investments of the Society, both real and personal, with full power and authority to buy and to sell, and to invest and reinvest the same; including the power to purchase and to sell real estate and to make leases thereof, to satisfy mortgages and extinguish ground rents, and to direct the placing of all such insurances as it may deem necessary; as well as to borrow on the credit of the assets of the Society, to create mortgages thereon, and to make such improvements, repairs and alterations to real estate as it may deem necessary. It shall have power to authorize the proper Officers of the Society to execute the necessary papers to effect all purchases, sales and assignments of property, both real and personal; to execute and to satisfy mortgages, to extinguish ground rents and to transfer registered securities; to subscribe to bond-holders' agreements to plans of reorganization involving any securities held by the Society or in which it has an interest, and to do all such acts as are necessary in pursuance of the foregoing powers.

Art. 4. The Committee on Finance shall always have

access to the Treasurer's books, accounts, and vouchers, and shall cause an audit of such accounts to be made at least once a year. It shall require from the Treasurer an annual report of all the operations of the treasury, which it shall present to the Council with an annual statement of estimates of receipts and expenditures. With the approval of the Council it shall determine the fiscal year of the Society and, in case of emergency needs, authorize appropriations over and above the annual budget.

ART. 5. There shall be a COMMITTEE ON RESEARCH, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four classes, who shall serve for three years and who shall be nominated by the President and elected by the Council. A majority of the Committee shall constitute a quorum at any meeting, and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on Publications, and of the Committee on Meetings, may sit with the Committee on Research but shall not vote.

ART. 6. The Committee on Research shall, with the approval of the Council, prescribe regulations for receiving and considering proposals for the advancement of knowledge through investigation. It may take such action as it shall see fit with respect to proposals received by it, and may, with the approval of the Council, itself initiate and cause to be executed investigations for the advancement of knowledge. It shall certify to the Treasurer all disbursements to be made from funds appropriated to it by the Council, and may allot therefrom such sums as it may see fit, on such conditions as it may prescribe, for the investigations approved by it. It shall require reports of the expenditures of all sums so allotted, and of the progress of all investigations aided thereby. It may withhold assistance in the event that the said reports are judged unsatisfactory.

ART. 7. The Committee on Research shall report all its acts to the Council, and from time to time submit reports

to the Society on the progress of the investigations aided by it, and on the contributions to the advancement of knowledge made by them.

Art. 8. There shall be a Committee on Publications, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four classes, who shall serve for three years, and who shall be nominated by the President and elected by the Council. A majority of the Committee shall constitute a quorum at any meeting, and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on Research and of the Committee on Meetings, may sit with the Committee on Publications but shall not vote.

Art. 9. The Committee on Publications shall supervise the contents, editing, printing, publication, distribution, and sale of all publications issued by the Society or in its name. It shall have power to employ necessary editorial assistance, and, with the approval of the Council, to appoint an Editor and to determine his duties and fix his compensation. It shall cause the necessary contracts for the manufacture of the Society's publications to be drawn up and executed. It shall certify to the Treasurer all bills which it shall have examined and approved for expenses attending the publications, as well as all disbursements to be made from funds appropriated to the Committee by the Council.

Art. 10. The Committee on Publications shall, with the approval of the Council, prescribe regulations for receiving and considering proposals for publication, and may take such action as it shall see fit with respect to proposals so received, including the allotment of funds appropriated to the Committee by the Council. The Committee shall have power to appoint referees or special sub-committees to assist it in the examination of material presented to it for publication and, in its discretion, to give honoraria for services so rendered. It shall report all its acts to the Council.

ART. 11. There shall be a COMMITTEE ON MEETINGS, consisting of the President, ex-officio, and of not fewer than four other members representative of the four classes. The Committee shall be appointed by the President and shall have power to add to its numbers. A majority of the Committee shall constitute a quorum at any meeting and shall be requisite for any vote disposing of funds that may be allotted to the Committee. The Chairman, or a member designated by the Chairman, of the Committee on Research and of the Committee on Publications, may sit with the Committee on Meetings but shall not vote.

ART. 12. The Committee on Meetings shall be charged with the preparation of the scientific and scholarly programs of all meetings of the Society, and of all meetings held under its auspices, and with the organization of discussions, symposia, and conferences. It shall have power to name special sub-committees to assist it, and to invite suitable persons, whether members of the Society or not, to participate in such programs, discussions, symposia, etc. The Committee shall have power to use such funds as may be appropriated to it by the Council for defraying the expenses of the programs, discussions, etc., organized by it, and shall certify to the Treasurer all disbursements to be made from such funds.

ART. 13. The Committee on Meetings shall transmit to the Committee on Publications all papers, communications, reports, and other materials which it may recommend for publication.

ART. 14. There shall be a COMMITTEE ON LIBRARY, consisting of the President, ex-officio, and of not fewer than six other members, representative of the four classes, who shall serve for three years and who shall be appointed by the President.

ART. 15. The Committee on Library shall supervise the administration of the Library, and shall, with the approval of the Council, prescribe regulations for its government and use. The Committee shall have power, with the ap-

proval of the Council, to employ a Librarian, determine his duties, and fix his compensation. It shall have charge of the exchange of publications, and shall have power to expend income of trust funds established specifically for purposes of the Library. The Committee shall prepare estimates of expenditures for the maintenance and increase of the Library, and shall certify to the Treasurer all bills properly payable and all disbursements to be made from funds appropriated by the Council for the purposes of the Library.

ART. 16. There shall be a COMMITTEE ON HALL, consisting of the President and Curator, ex-officio, and such other members as may be appointed by the President. They shall serve for three years and shall have charge of the Hall of the Society and of its furniture and fixtures and shall direct all necessary repairs.

ART. 17. There shall be a COMMITTEE ON NOMINATION OF OFFICERS consisting of five members,—a Chairman, appointed by the President, and the four Councillors who are entering the third year of their term of service.

ART. 18. The Committee shall, not later than December first, invite all members of the Society to submit to it informal suggestions for nominations to all offices to be filled by election at the next General Meeting.

ART. 19. The Committee shall then communicate to all members of the Society, not later than March first, a report presenting one nomination to each office to be filled by election at the next General Meeting. Nominations may also be made by petition if signed by twenty or more members and submitted to the Chairman not later than March thirty-first. Notice of such nomination must be sent to all members by April first.

ART. 20. The Committee shall prepare for use in the elections at the General Meeting a ballot in which shall be included, under each position to be filled by election, the name of the Committee's nominee, and the names, in alphabetical order, of any nominees included in petitions duly received in accordance with the Laws.

Chapter VI

On the Meetings of the Society

Art. 1. The Annual General Meeting shall be held in the month of April on days designated by vote of the Council, adopted at least three months before the date fixed therefor, at which it shall be lawful to transact all business not in contravention of the Laws.

Art. 2. The Autumn General Meeting shall be held on days designated by vote of the Council, usually in the month of November, at which it shall be lawful to transact all business not in contravention of the Laws.

Art. 3. Special meetings may be called at any time by order of the President, or, in his absence or disability, by order of a Vice-president, or by vote of the Council, for the consideration of matters of scientific or scholarly interest or for the transaction of such business as shall be specified in the order or vote calling the meeting.

Chapter VII

Of the Publications of the Society

Art. 1. The publications of the Society shall consist of Proceedings, Transactions, Memoirs, Year Book, and of such other serial or separate publications as may be authorized by the Council upon recommendation by the Committee on Publications.

Art. 2. The Proceedings shall contain papers that are read before the Society at its meetings and that have been approved by the Committee on Publications. Other papers from whatever source may also be published in the Proceedings if approved by this Committee. The Proceedings will be distributed without charge, as issued, to the members who request it.

Art. 3. The Transactions shall consist of contributions in the form of monographs, treatises, collections of documents, and other materials, approved by the Committee on Publications. The Transactions shall be issued in complete parts, one or more of which may constitute a volume.

They may be supplied to any member on such conditions or terms as may be prescribed by the Committee on Publications.

Art. 4. The Memoirs shall consist of works approved by the Committee on Publications. They shall be issued in such form as shall make possible their assembly in volumes according to subject matter, or to fields of knowledge. They may be supplied to any member on such conditions or terms as may be prescribed by the Committee on Publications.

Art. 5. The Year Book shall contain, among other items, the Charter and Laws, list of Officers and Committees, the annual report of the President and Officers, important acts of the Society and Council, reports of all standing Committees, a catalogue of prizes, premiums and lectureships, lists of all members together with those elected and those deceased during the year, and obituaries of deceased members. It shall be published as soon as possible after the close of each calendar year and shall be sent gratis to all members of the Society.

Chapter VIII

Of the Laws of the Society and their Amendment

Art. 1. No amendment or supplement to these laws, nor any new law shall be made or passed by the Society, unless the same has been duly proposed in writing at a Stated Meeting of the Society and enacted at the subsequent General Meeting; due notice of the proposed law or amendment having been sent by mail at least fourteen days before the said General Meeting to the members qualified to vote thereon.

Art. 2. At the General Meeting no amendment or supplement to these laws shall be made, nor shall any new law be made, unless there be present a quorum of at least twenty members, of whom not fewer than five shall be members of the Council, and the same be voted by two-thirds of the whole body present.

III

OFFICERS AND COMMITTEES
1942–1943

OFFICERS

PATRON

The Governor of Pennsylvania

PRESIDENT

Edwin G. Conklin

VICE-PRESIDENTS

William E. Lingelbach   Frank Aydelotte   Frederick P. Keppel

SECRETARIES

W. F. G. Swann   Benjamin D. Meritt

CURATOR

Albert P. Brubaker

TREASURER

Fidelity-Philadelphia Trust Company

EXECUTIVE OFFICER

Luther P. Eisenhart

LIBRARIAN AND EDITOR OF PUBLICATIONS

William E. Lingelbach

COUNCILLORS

Elected in 1940	Elected in 1941	Elected in 1942
Detlev W. Bronk	William B. Dinsmoor	Campbell Bonner
Nathan Hayward	Ross G. Harrison	Douglas Johnson
Leicester B. Holland	Herbert E. Ives	C. E. Kenneth Mees
Harlow Shapley	Joseph H. Willits	Roland S. Morris

STANDING COMMITTEES

The President is *ex-officio* a member of all committees except the Committee on Nomination of Officers. The first member named in each committee is Chairman. The Executive Officer sits with all committees but does not vote unless regularly a member.

FINANCE
(For one year, 1942–43)

Marshall S. Morgan
Morris Duane
Thomas S. Gates
Edward Hopkinson, Jr.
John Story Jenks
Roland S. Morris
Charles J. Rhoads
J. Henry Scattergood

HALL
(For three years)

John Story Jenks (1940–43)
Paul P. Cret (1942–45)
Leicester B. Holland (1942–45)
Marshall S. Morgan (1942–45)
Lawrence J. Morris (1942–45)
Francis R. Packard (1941–44)
John M. Scott (1942–45)
Albert P. Brubaker, Curator

RESEARCH
(For three years)

Luther P. Eisenhart (1942–45)
William F. Albright (1942–45)
Detlev W. Bronk (1942–45)
Edward P. Cheyney (1942–45)
Gilbert Chinard (1941–44)
Eugene F. DuBois (1942–45)
Frank A. Fetter (1942–45)
Frederick P. Keppel (1942–45)
Roland S. Morris (1942–45)
Harlow Shapley (1942–45)
Edmund W. Sinnott (1940–43)
W. F. G. Swann (1942–45)
Hugh S. Taylor (1942–45)

PUBLICATIONS
(For three years)

Jacob R. Schramm (1941–44)
Franklin Edgerton (1942–45)
Luther P. Eisenhart (1942–45)
William E. Lingelbach (1942–45)
Forest R. Moulton (1942–45)
Arthur D. Nock (1942–45)
Ernest M. Patterson (1941–44)
Conyers Read (1942–45)
Adolph H. Schultz (1942–45)
T. Leslie Shear (1942–45)
George G. Simpson (1942–45)
Harold C. Urey (1941–44)

MEETINGS
(For one year, 1942–43)

Luther P. Eisenhart
C. F. Tucker Brooke
Karl K. Darrow
William B. Dinsmoor
William E. Lingelbach
Ernest M. Patterson
William J. Robbins
Wendell M. Stanley
Joseph H. Willits

LIBRARY
(For three years)

William E. Lingelbach (1942–45)
Rhys Carpenter (1940–43)
J. Percy Moore (1940–43)
Horace C. Richards (1942–45)
A. S. W. Rosenbach (1941–44)
St. George L. Sioussat (1942–45)
Lynn Thorndike (1942–45)

COMMITTEES ON MEMBERSHIP

(For one year, 1942–43)

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

Harlow Shapley
Gilbert A. Bliss
Karl K. Darrow
Jerome C. Hunsaker
Hugh S. Taylor

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Detlev W. Bronk
Arthur F. Buddington
Ross G. Harrison
Burton E. Livingston
Robert M. Yerkes

CLASS III. SOCIAL SCIENCES

Ernest M. Patterson
Edward S. Corwin
Guy Stanton Ford
Philip C. Jessup
Charles J. Rhoads

CLASS IV. HUMANITIES

Campbell Bonner
Edward C. Armstrong
Carl W. Blegen
C. F. Tucker Brooke
Edgar A. Singer, Jr.

COMMITTEE ON NOMINATION OF OFFICERS

(For one year, 1942–43)

Alfred Newton Richards, Chairman

Detlev W. Bronk
Nathan Hayward
Leicester B. Holland
Harlow Shapley
} Retiring Councillors

SPECIAL COMMITTEES

The first named in each Committee is Chairman.

EDUCATION AND PARTICIPATION IN SCIENCE

(Discontinued after Annual Meeting)

Edwin G. Conklin
Anton J. Carlson
Karl K. Darrow
Luther P. Eisenhart
C. E. Kenneth Mees
Oscar Riddle
Harlow Shapley
George G. Simpson
W. F. G. Swann
Edward L. Thorndike
Harold C. Urey
Roland S. Morris, ex-officio
W. Stephen Thomas,[1] Executive Secretary

BICENTENNIAL CELEBRATION OF THE BIRTH OF THOMAS JEFFERSON

Roland S. Morris
Gilbert Chinard
Frederic A. Delano
Samuel A. Mitchell
St. George L. Sioussat
W. F. G. Swann
Charles Warren
Thomas J. Wertenbaker

[1] Commissioned, U. S. Navy.

LEWIS PRIZE

Luther P. Eisenhart
Detlev W. Bronk
Gilbert Chinard

MAGELLANIC PRIZE

Roland S. Morris
Lyman J. Briggs
Harvey N. Davis
Harlow Shapley

EDITORIAL BOARD

William E. Lingelbach, Editor-in-Chief
Francis Harper, Assistant to Editor
Karl K. Darrow, Editor for Class I
Merkel H. Jacobs, Editor for Class II
Ernest M. Patterson, Editor for Class III
Rhys Carpenter, Editor for Class IV
Together with the Committee on Publications

EXECUTIVE OFFICE STAFF

Luther P. Eisenhart, Executive Officer
Julia A. Noonan, Assistant Secretary
Marie A. Richards, Assistant in the Office *

* Granted leave of absence for war production service, October 15, 1942.

LIBRARY STAFF

William E. Lingelbach, Librarian
Gertrude D. Hess, Assistant Librarian
Alban W. Hoopes, Archivist
Ruth A. Duncan, Assistant in the Library
Mary C. Dothard, Stenographer
George Thomas Garver, Jr., Microfilm Photographer *
M. Barbara O'Neill, Restorer of Manuscripts

* Military Service, July 15, 1942.

IV

MINUTES OF THE MEETINGS AND OF THE EXECUTIVE SESSIONS

1. MIDWINTER MEETING, FEBRUARY 13, 14, 1942

The Midwinter Meeting program was devoted to the Symposium on The Early History of Science and Learning in America with especial reference to the work of the Society during the eighteenth and nineteenth centuries.

Fifty-eight members and approximately fifty guests attended this meeting and sixteen papers were read.[1] The John Scott Medals and Premiums by the City of Philadelphia, through the Board of City Trusts, were presented at this meeting.[2]

Morris Duane, Howard Mumford Jones, William H. Taliaferro, recently elected members, and Edgar Douglas Adrian, recently elected foreign member, subscribed the Laws and were admitted into the Society.

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2. ANNUAL GENERAL MEETING, APRIL 23, 24, 25, 1942

The first day of the Annual Meeting was devoted to a Symposium on Recent Advances in American Archaeology and sixteen papers were read at this meeting. Eighteen papers dealing with various subjects were read at the subsequent sessions.[3]

One hundred and twenty-five members and approximately one hundred guests attended the meeting. The Society's initial broadcast of a weekly series in cooperation with the World Wide Broadcasting Foundation over Station WRUL was given at 5 P.M. on Friday, April 24.[4]

The following recently elected members subscribed the Laws and were admitted into the Society during the course of the meeting: Carl William Blegen, Fay-Cooper Cole, Andrew Ellicott

[1] See p. 48.
[2] See p. 49.
[3] See p. 50.
[4] See p. 52.

Douglas, Guy Stanton Ford. Walter Samuel Hunter, George William McClelland, Arthur D. Nock, Charles W. Metz, and A. Baird Hastings.

Friday, April 24, 1942, 9.30 A.M.

EXECUTIVE SESSION

Roland S. Morris, President, in the Chair

President Morris read the names of those members[1] who had died since the last meeting while the members present stood as a mark of respect.

The proceedings of the Council at its meeting of April 22 were approved.

President Morris presented a brief account of the financial condition of the Society and stated that the Society had received a bequest of $45,000 from one of its former members, James Edward Whitfield, of the chemical firm of Booth, Garrett, and Blair, who was elected to membership in 1905 and remained a member for a quarter of a century. Since Mr. Whitfield left no relatives or family connections with whom the Society could communicate, President Morris recommended that an expression of appreciation be placed on the Minutes. On motion, duly seconded, it was

> *Resolved,* that the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge hereby records its grateful appreciation for the bequest of $45,000 from the estate of our late member, James Edward Whitfield.

The Society was informed that the work of the Committee on Education and Participation in Science, which had been supported by the Carnegie Corporation, had been completed under the able management of W. Stephen Thomas, Secretary of the Committee, and that the results of the study are included in a volume by Mr. Thomas to be published in the near future.[2] Since Mr. Thomas informed the Society that he was about to enter the Government Service, the Committee requested that it be discharged with its initial task accomplished. Dr. Keppel spoke in appreciation of the work of the Committee and stated that the Carnegie Corporation is deeply grateful to the Society for its part in this enterprise.

[1] See p. 327.

[2] Thomas W. Stephen, *The Amateur Scientist.* 291 pp. W. W. Norton Co. (1942).

President Morris reported briefly on an activity of the Society in cooperation with the World Wide Broadcasting Foundation to be initiated that afternoon over Station WRUL in the first of a series of short-wave broadcasts [1] from its Hall to countries overseas where the English language is spoken and understood and where there is still interest in the progress of science and learning; these broadcasts are to be given every Friday afternoon at 5 P.M. and are to begin with the sound of the bell in Independence Hall tower with its message: "Proclaim Liberty throughout all the land unto all the inhabitants thereof." These broadcasts are intended to bring to other lands the message of American thought and progress. For this purpose, President Morris stated that the Council had recommended an appropriation of $25,000 from the $100,000 which had previously been appropriated for the Committee on Research. The Society expressed its approval of this project.

The Society was informed that Council had appointed Professor Luther P. Eisenhart, Dean of the Graduate School of Princeton University, as the Executive Officer of the Society on half time and Dr. William E. Lingelbach, University of Pennsylvania, in charge of publications and of the Library on half time.

President Morris reported that Mr. Marshall Morgan had visited the Michaux Garden Tract near Charleston, S. C., which is located within half a mile of the airport, and asked if a Committee should not be appointed to confer with representatives of the City of Charleston with regard to its preservation as a memorial to Michaux. A Committee consisting of Marshall S. Morgan and Gilbert Chinard was appointed to look into this matter. On motion, duly seconded, an appropriation of $1500 from the Michaux Fund was approved for the use of the Committee.

President Morris stated that the Committee on Publications and the Council have approved the general policy of limiting the funds assigned to the Committee on Publications to the Society's own publications. Applications for grants for other publications would have to go to the Council.

President Morris reported that the volume containing six Ancient Mexican documents, four of them from the Tribute Roll of Montezuma and two Calendar Sheets, had been returned to the National Museum of Archaeology, History and Ethnography, Mexico, on the occasion of the Dedication of the Benjamin Franklin

[1] See pp. 52, 56.

Library in the City of Mexico. This return of priceless documents was greatly appreciated by the Mexican Government.

These six original sheets from the Tribute Roll and Calendar of Montezuma have been in the Library of the American Philosophical Society in Philadelphia since 1830, when they were presented to the Society by the Honorable Joel R. Poinsett, First Minister of the United States of America to the Republic of Mexico. They are now, by vote of the Society, returned to the National Museum of Archaeology, History and Ethnography of Mexico, in order that they may complete the original Codex of which they were once a part, and which is now preserved in the collections of that Museum. This return was made through the good offices of the Ambassador of the United States on April 14, 1942, in connection with the Inauguration of the Benjamin Franklin Library in the City of Mexico, which bears the name of the Founder and first President of the American Philosophical Society held at Philadelphia for Promoting Useful Knowledge.

Our member, Dr. H. M. Lydenberg, Librarian and Director of the Biblioteca Benjamin Franklin represented the Society on this occasion and presented the Tribute Roll and Calendar of Montezuma to Doctor Alfonso Caso, Director of the Instituto Nacional de Anthropología e Historia, who responded for the Minister of Education as well as for himself and his Institute in a gracious expression of thanks.

The program of this important occasion together with the addresses given and letters of appreciation are filed in the Archives of the Society.

The proposed amendment to the Laws regarding the duties of the Committee on Nomination of Officers was considered and approved as follows:

> Chapter I, Article 19 reads: "The Committee shall then communicate to all members of the Society, not later than February first, a report presenting one nomination to each office to be filled by election at the next General Meeting. Nominations may also be made by petition if signed by twenty or more members and submitted to the Chairman not later than March first. Notice of such nomination must be sent to all members by April first."
>
> *Amend as follows:*
>
> Substitute "March" in place of "February" in the first sentence and "thirty-first" in place of "first" in the second sentence.

President Morris stated that the Council had recommended an appropriation of $600 for the work of the Pennsylvania Committee on Conservation of Cultural Resources, and Dr. Lingelbach, Chairman, reported briefly on the work of the Committee. The Society approved this recommendation.

A letter of thanks and appreciation was read from the Marine Biological Association of the United Kingdom regarding a grant it had received from the Royal Society of London "for emergency measures necessitated by recent air-raid damage and essential for the maintenance of research work in the laboratory." This grant was made from the gift of the American Philosophical Society to aid science and learning in Britain.

The following Committee on Finance was nominated by the President and elected for the year 1942–43:

Marshall S. Morgan, *Chairman*	John Story Jenks
Morris Duane	Edward Hopkinson
Thomas S. Gates	Roland S. Morris
Charles J. Rhoads	J. Henry Scattergood

The Committee on Finance will also serve as the Committee on Building Fund.

President Morris announced the names of those persons elected by the Council to serve on the Committees on Research and Publications for the next three years.

Dr. Conklin, Chairman of the Committee on Research, presented his report and gave a brief account of the activities of the Committee. Copies of the report reprinted from the Year Book were distributed.

Mr. Morgan, Chairman of the Committee on Finance, presented his report and called attention to the distribution of the Society's investments in Government bonds and stocks. Reprints of this report were distributed and the members were requested to confer with Mr. Morgan if they had any questions to ask.

Dr. Schramm, Chairman of the Committee on Publications, reported on the activities of the Committee during the year, and called attention to the recently adopted policy of the Committee that it will spend its funds on the operation of the Society's own publications together with the attendant expenses, and that requests for aid to outside publications will go to whatever channel the Society may designate. In general, the publications of the Society were

discussed and the question of distribution was considered. This matter with the help of Dr. Lingelbach, who has general charge of publications, will be one of the questions engaging the attention of the Committee this coming year.

Dr. Conklin, Chairman of the Committee on Meetings, presented his report and gave a brief account of the activities of the Committee.

President Morris stated that Dr. Sioussat, Chairman of the Committee on Library, was unable to be present, and that he had tendered his resignation as Chairman. The following resolution was unanimously approved:

> *Resolved*, that the members of the American Philosophical Society desire to express to Dr. St. George L. Sioussat, as he now retires at his own request from the Chairmanship of the Committee on Library, their high appreciation of his services in a critical time in the Society's history. He superintended the transfer of the Library from this building and from other places where the books had been stored to its present quarters in the Drexel Building, and he has been ever watchful in caring for the Society's treasures and in adding to them. His active participation in the work of the Committee on the Future Policy of the Library is greatly appreciated. The members of the Society hope that Dr. Sioussat may continue as a member of the Committee on Library for years to come.

Dr. Leland moved that the following testimonial be spread upon the Minutes of this meeting, and that it be inscribed in proper fashion and given to the present President of the Society, the Honorable Roland S. Morris.

> Dear Mr. Morris:
>
> The Members of the American Philosophical Society, assembled in Philadelphia in Annual Meeting on the 24th of April, 1942, desire to express to you, as you retire from the office of President of the Society, after ten years of service of extraordinary distinction, their appreciation and gratitude.
>
> The Members realize the great value to the Society of the wisdom and devotion that you have applied to the administration of its affairs. They recognize that during your Presidency the Society has passed through one of the most significant periods of its long history, and that your leadership, exercised always with tact and with the self-effacing humility of the great in spirit, has been a central factor in the process of change and evolution.
>
> The generosity of former Members of the Society has, dur-

ing this period, greatly increased the Society's material resources, and decisions of the utmost importance have had to be made respecting their management and their employment for promoting useful knowledge. You have brought it about that these decisions have been made by the Society as a whole, after full deliberation, and this process has imparted to all the Members a strong sense of individual and corporate responsibility. Under your administration the Society has revised its Laws and has adapted them to its present circumstances; it has improved its organization and procedure, and has re-emphasized its national character and the catholicity of its interests; it has concerned itself with the diffusion as well as the promotion of knowledge; and it has become an active and central part of the organization of intellectual life in the United States.

The Members of the Society will remember your Presidency as an era that has permanently influenced the character of the Society; an era in which the important decision was reached to remain in its historic home on Independence Square and to restore and reoccupy the entire building; an era in which the Library was rehoused in more spacious quarters and its future policy defined; an era of great activity in the support of research and publication and of increased interest in meetings and a growing devotion and cooperation among the Members.

The Society thanks you for the great services that you have given to it, and the Members cannot but regret your decision to retire from your office, but they rejoice in the assurance that your intellectual powers, your practical wisdom, and the resources of your personality will be devoted to the Society in the future as in the past.

The motion was unanimously carried and a rising vote of thanks was extended to President Morris.

President Morris stated that he was deeply touched by this tribute that had been offered to him. Dr. Conklin who has been my help and strength and who has carried so much of the burden, without whom the changes could not have taken place in the Society, I am happy to say is going to be my successor, and I know of no one who can do more and who has done more in the Society than he has. I do wish to pay that tribute to him.

You have given me the greatest distinction that I have had in my life, to preside over the Society, and now that the ten years are over, I thank you for the thrilling time I have had doing that work. It is one of the most delightful experiences of my life. It has given me friendships and associations that I shall always cherish. Thank you so much.

A copy of this testimonial, signed by the Secretaries of the Society under date of April 24, 1942, engrossed and bound in embossed Morocco was presented to Mr. Morris.

Annual Election

The Society proceeded to the election of officers and members. Morris Duane and George W. Corner acted as Judges and Jacob R. Schramm as Clerk of Election.

The tellers subsequently reported that the following officers and members had been duly elected:

OFFICERS

President

Edwin G. Conklin

Vice-Presidents

William E. Lingelbach
Frank Aydelotte
Frederick P. Keppel

Secretaries

W. F. G. Swann
Benjamin D. Meritt

Curator

Albert P. Brubaker

Treasurer

Fidelity-Philadelphia Trust Company

Councillors

(To serve for three years)

C. E. Kenneth Mees, *Class I*
Douglas Johnson, *Class II*
Roland S. Morris, *Class III*
Campbell Bonner, *Class IV*

(To fill vacancy created by the election of
F. P. Keppel to the Vice-Presidency)

Leicester B. Holland, *Class IV*

MEMBERS

CLASS I—MATHEMATICAL AND PHYSICAL SCIENCES

Resident

Oliver Ellsworth Buckley, New York, N. Y.
Lee Alvin DuBridge, Rochester, N. Y.
Duncan Arthur MacInnes, New York, N. Y.
Robert Raynolds McMath, Pontiac, Mich.
Francis Dominic Murnaghan, Baltimore, Md.
Harald Malcolm Westergaard, Cambridge, Mass.
Robert R. Williams, Summit, N. J.

Foreign

Harold Spencer Jones, Greenwich, England
Hendrik Anthony Kramers, Leiden, Netherlands
Ivan Matveitch Vinogradov, Moscow, U. S. S. R.

CLASS II—GEOLOGICAL AND BIOLOGICAL SCIENCES

Resident

Leonard Carmichael, Medford, Mass.
Theodosius Dobzhansky, New York, N. Y.
Edward Adelbert Doisy, St. Louis, Mo.
Carl Owen Dunbar, New Haven, Conn.
Louis Otto Kunkel, Princeton, N. J.
Thomas Milton Rivers, New York, N. Y.
Lewis Hill Weed, Baltimore, Md.

CLASS III—SOCIAL SCIENCES

Resident

Warren Randolph Burgess, New York, N. Y.
James McCauley Landis, Cambridge, Mass.
Robert Morrison MacIver, Palisades, N. Y.
Bernadotte Everly Schmitt, Chicago, Ill.
Robert Livingston Schuyler, New York, N. Y.
Jacob Viner, Chicago, Ill.
John Henry Williams, Cambridge, Mass.

Foreign

Octavio Méndez-Pereira, Panama City, Panama
Richard Henry Tawney, London, England
Paul van Zeeland, Brussels, Belgium

CLASS IV—HUMANITIES

Resident

Leonard Bloomfield, New Haven, Conn.
Clarence Irving Lewis, Lexington, Mass.
Robert Harry Lowie, Berkeley, Calif.
Thomas Mann, Pacific Palisades, Calif.
Gisela Marie Augusta Richter, New York, N. Y.
Carl Van Doren, New York, N. Y.

Foreign

Amado Alonso, Buenos Aires, Argentina
Sir William A. Craigie, Oxford, England

COUNCIL NOMINEES

Lewis Williams Douglas, New York, N. Y.
Alvin Saunders Johnson, Nyack, N. Y.
Nicholas Kelley, New York, N. Y.

3. AUTUMN GENERAL MEETING, NOVEMBER 20, 21, 1942

The first day of the Autumn General Meeting program was devoted to the continuation of the Symposium on The Early History of Science and Learning in America.

Eighty-four members and approximately fifty guests attended this meeting and twenty papers were read.[1]

The following recently elected members subscribed the Laws and were admitted into the Society: Leonard Bloomfield, Nicholas Kelley, Robert Livingston Schuyler, Robert Morrison MacIver, Francis D. Murnaghan, Robert Sessions Woodworth, Theodosius Dobzhansky, and L. O. Kunkel. Thomas J. Wertenbaker, recently elected member, signed the book though he had been admitted into the Society at a previous meeting.

Saturday, November 21, 9.30 A.M.

EXECUTIVE SESSION

Edwin G. Conklin, President, in the Chair

President Conklin reported that a letter had been received from Walter S. Lemmon, President of the World Wide Broadcasting

[1] See p. 54.

Foundation, regarding the financial aspect of the broadcasts carried out under the auspices of the Society; that a sum of $12,000 has been paid to the Foundation from the grant of $25,000; and that the Government has taken over the short-wave Station WRUL, and the question as to how far the Foundation will be allowed to put on programs is still under negotiation. The following motion recommended by Council was approved:

> *Resolved,* that the Society allow the World Wide Broadcasting Foundation to have a credit of $3,000 which will be paid when the Society is assured that the broadcasts may be resumed and that a program has been formulated and approved by the Committee in Charge, consisting of Edwin G. Conklin, Roland S. Morris, Harlow Shapley, Luther P. Eisenhart and W. F. G. Swann, which has been authorized to act in the interval of the meetings of the Council.

Amendments to the Laws

The amendment to the Laws proposed at the General Meeting in April with respect to the duties of the Committee on Nomination of Officers was on motion, duly seconded, approved as follows:

> Chapter V, Article 19 reads: "The Committee shall then communicate to all members of the Society, not later than February first, a report presenting one nomination to each office to be filled by election at the next General Meeting. Nominations may also be made by petition if signed by twenty or more members and submitted to the Chairman not later than March first. Notice of such nomination must be sent to all members by April first.
>
> *Amended as follows:*
>
> Substitute "March" in place of "February" in the first sentence and "thirty-first" in place of "first" in the second sentence.

The following new amendment to the Laws was proposed by President Conklin and it was the sense of the meeting that copies of this proposal be sent to each member of the Society in advance of the April meeting, at which time it will be voted upon.

> *Insert new Article:*
>
> Chapter III, Article 10. "No elective office in the Society except that of Treasurer shall carry any salary, but Officers may be reimbursed for any necessary expenditures made in the performance of their duties."

Copies of the report of the Committee on Finance were distributed and Mr. Morgan gave an account of the work of the Committee and of the Treasurer. The report of the Committee and the budget for 1943, as recommended by Council, were on motion, duly seconded, approved.

President Conklin expressed the Society's appreciation to the Committee on Finance for the splendid work it has done in the financial situation of the Society.

The Council recommended the dissolution of the present Deed of Trust between the Girard Trust Company and the Society and the creation of a new Deed of Trust. The following resolutions were then presented and discussed:

> WHEREAS, this Society and the Girard Trust Company of Philadelphia under date of June 4, 1900 entered into an agreement with the Girard Trust Company of Philadelphia, thereby placing certain funds of the Society in trust with the said Trust Company with the powers and duties and for the purposes therein set forth, said purposes being primarily for the acquisition of land and the construction, enlargement, refitting, altering or furnishing of buildings for the use and occupation of the Society or its property, and,
>
> WHEREAS, from time to time since the creation of the said trust, the Society, by the action of its membership, Council, Committees or Officers, has added funds to the said trust, and,
>
> WHEREAS, the Society does not wish to use the fund at the present time for the erection of a building, and,
>
> WHEREAS, the income from the fund has been accumulating for some period past and has been added to the principal thereof, except for such expenditures as have been authorized therefrom by the Building Fund Committee for the purpose of furnishing or refitting buildings, and,
>
> WHEREAS, the Finance Committee, the Building Fund Committee, and the Council have recommended that the income from this fund shall be made available for the general purposes of the Society,
>
> NOW THEREFORE
>
> *Be It Resolved,* that the dissolution of the present Deed of Trust between the Society and the Girard Trust Company, dated June 4, 1900, and the creation of a new Deed of Trust be and they are hereby approved, the new Deed of Trust to provide substantially as follows:
>
> That the Girard Trust Company shall continue as Trustee to hold the principal of the trust;

That the income shall be used for the following purposes:

(*a*) For the purchase, building, maintenance, repair, and furnishing or the payment of insurance, taxes or any other moneys or expenses due or payable in connection with any property, real or personal, owned or acquired by the Society.

(*b*) For the rental of any property, real or personal, necessary or proper for the performance of the purposes and functions of the Society.

(*c*) For the general purposes of the Society.

(*d*) To be accumulated and added to principal.

That the principal of the fund can be expended only in accordance with the provisions of the Deed of Trust with the said Girard Trust Company, dated June 4, 1900;

That the foregoing and any other provisions of the Deed may be amended at any time by agreement of the Society and the Girard Trust Company as Trustee; and,

That all sales and investments of the Fund shall be made by the Trustee only upon the direction of the Finance Committee of the Society.

Further Resolved, that the Officers of the Society be and they are hereby authorized to enter into an agreement with the Girard Trust Company for the dissolution of the present Deed of Trust and the creation of a new Deed of Trust in form approved by counsel for the Society, to carry out the foregoing resolution.

Further Resolved, that the Officers of the Society and its counsel be and they are hereby authorized to prepare and execute on behalf of the Society the necessary documents and agreements to carry out the foregoing resolution.

Further Resolved, that the Officers of the Society be and they are hereby authorized to enter into, in form approved by counsel for the Society, an agreement of indemnification whereby the Society will indemnify and hold harmless the Girard Trust Company of and from any claims or demands which may be made against it or from any losses of any kind which may be suffered by it by reason of the acts of the said Girard Trust Company in dissolving the Deed of Trust dated June 4, 1900 and executing a new Deed of Trust as aforesaid.

It was the opinion of certain members of the Society that section (*c*) *For the general purposes of the Society* should not be included in the resolutions proposed. After some discussion the resolutions were adopted and the matter of the wording of sections *c* and *d* was on motion referred to the Committee on Finance with power to modify or leave the same unchanged.

Dr. Eisenhart, Chairman of the Committee on Research, gave an account of the work of the Committee during the year. Attention was called to the fact that the number of requests for research grants has declined somewhat in some fields. This is particularly true in those fields in which men are now engaged in research related to the war. The Committee in its consideration of requests for grants has not lowered its standards so as to expend available funds, and, consequently, at the close of the year a substantial balance in the Research Funds will be available. The Committee's request, that the sums allotted to Research shall not lapse but shall be carried as a Special Fund to be used as the needs require, was approved.

Dr. Schramm, Chairman of the Committee on Publications, presented his report, and Dr. Lingelbach, Editor, reported on the publications now in press and on hand for issuance in the MEMOIRS and TRANSACTIONS.

The Secretary read the names of those members[1] who had died since the last meeting while the members present stood as a mark of respect.

The dates for the Annual General Meeting, April 22, 23, and 24, 1943, were formally approved.

[1] See p. 327.

V

REPORTS OF STANDING COMMITTEES

1. REPORT OF THE COMMITTEE ON MEETINGS

The Committee on Meetings for the year 1942–43 consists of Edwin G. Conklin, *President*, Luther P. Eisenhart, *Chairman*, C. F. Tucker Brooke, Karl K. Darrow, William B. Dinsmoor, William E. Lingelbach, Ernest M. Patterson, William J. Robbins, Wendell M. Stanley, and Joseph H. Willits. During 1942 the Committee held four meetings, namely on February 12, May 20, October 21, and December 16.

The Committee for the year 1941–42 organized for the Midwinter Meeting a program devoted to the Early History of Science and Learning in America with especial reference to the work of the Society during the eighteenth and nineteenth centuries. Those attending the meeting declared it to be a highly significant occasion. The papers read on this occasion, with two exceptions, are published in the PROCEEDINGS, Vol. 86, No. 1. When the program was organized, it was realized that all fields could not be covered in this one meeting, and it was announced at this meeting that at a later meeting a program devoted to the humanities and social studies may be presented at a subsequent meeting. A program dealing with these fields was organized by the present committee for the Autumn Meeting of the Society. The papers read at this meeting and two read at the former meeting are to be published in the PROCEEDINGS, Vol. 87, No. 1. These two sets of papers constitute an important record of the early history of the liberal arts and sciences in America.

The Committee decided to devote the Midwinter Meeting of 1943 to a symposium on Post-War Problems. A special committee consisting of Ernest M. Patterson, Chairman, Luther P. Eisenhart, William E. Lingelbach and Joseph H. Willits has prepared a program for February 19, morning, afternoon and evening, and the morning of February 20, in which ten speakers participate, each address to be followed by discussion.

April 13, 1943, will be the two hundredth anniversary of the birth of Thomas Jefferson, who was the third president of the So-

ciety, serving from 1797 to 1815. At the meeting of the Committee on Meetings, October 15, 1941, it was proposed that the special feature of the Annual Meeting in 1943 should be the celebration of the Bicentenary of the Birth of Thomas Jefferson. This proposal was approved at the Executive Session of the Society, November 22, 1941. A special committee was appointed to prepare the program for that occasion, consisting of Roland S. Morris, Chairman, Gilbert Chinard, Frederic A. Delano, Samuel A. Mitchell, St. George L. Sioussat, Charles Warren, and Thomas J. Wertenbaker. This special committee and the regular committee cooperated in the arrangement of a program to occupy the first day and evening of the Annual Meeting of 1943. Eight speakers were selected to deal with the various aspects of the scholarly and artistic work of Jefferson, and his connection with the Society.

Since the date of the Annual Meeting for 1943 marks the two hundredth anniversary of Benjamin Franklin's proposal for the establishment of the American Philosophical Society, the Committee decided to make this anniversary the special feature of the Annual Dinner of the Society.

REGULAR MEETINGS OF THE SOCIETY

MIDWINTER MEETING, FEBRUARY 13, 14, 1942

SYMPOSIUM ON THE EARLY HISTORY OF SCIENCE AND LEARNING IN AMERICA [1]

WITH ESPECIAL REFERENCE
TO THE WORK OF THE SOCIETY DURING
THE EIGHTEENTH AND NINETEENTH CENTURIES

Friday, February 13, 10:00 A.M.

EDWIN G. CONKLIN, Vice-president, in the Chair

"Mathematics: Life and Work of James Logan." Frederick E. Brasch, Library of Congress.

"Astronomy During the Early Years of the Society." Samuel Alfred Mitchell, Director, Leander McCormick Observatory, University of Virginia.

"Some Early American Physicists." Horace C. Richards, Professor Emeritus of Physics, University of Pennsylvania.

"A Review of Papers on Meteorology and Climatology." William J. Humphreys, Collaborator, United States Weather Bureau. (Read by F. W. Reichelderfer, Chief, United States Weather Bureau.)

[1] See p. 54.

"Chemistry: Joseph Priestley. Detlev W. Bronk, Professor of Biophysics and Director of the Eldridge Reeves Johnson Foundation for Medical Physics. University of Pennsylvania.

Friday, February 13, 2:00 P.M.

William E. Lingelbach, Vice-president, in the chair

"Engineering in Our Early History." Dugald Caleb Jackson, Professor Emeritus of Electrical Engineering, Massachusetts Institute of Technology.
"Survey of Scientific Agriculture." M. L. Wilson, Under-Secretary, United States Department of Agriculture.
"Some Early Botanists of the Society." M. L. Fernald, Professor and Director, Gray Herbarium, Harvard University. (Read by John M. Fogg, Jr., Dean of the College, University of Pennsylvania.)
"Benjamin Smith Barton as Naturalist." Francis W. Pennell, Curator of Plants, Academy of Natural Sciences of Philadelphia.
"Entomology, Scientific and Human Aspects." Philip P. Calvert, Professor Emeritus of Zoology, University of Pennsylvania; Research Fellow, Academy of Natural Sciences of Philadelphia.
"Geological Research in America (1850–1900)." Bailey Willis, Professor Emeritus of Geology, Stanford University.

Friday, February 13, 8:30 P.M.

Roland S. Morris, President, in the Chair

AWARD OF THE
JOHN SCOTT MEDALS AND PREMIUMS

by The City of Philadelphia, Through its Board of City Trusts, to

Major Edwin H. Armstrong, Professor of Electrical Engineering, Columbia University, for his work in Frequency Modulation in Radio.
Robert R. Williams, Chemical Director, Bell Telephone Laboratories, for his work on Thiamin (Vitamin B_1).

Major Armstrong and Dr. Williams responded graciously and gave brief accounts of their work.

The program was followed by a reception.

Saturday, February 14, 10:00 A.M.

Roland S. Morris, President, in the Chair

"The Beginnings of Vertebrate Paleontology in North America." George Gaylord Simpson, Associate Curator of Vertebrate Paleontology, American Museum of Natural History.

"Medicine and the American Philosophical Society." Francis R. Packard, Editor, *Annals of Medical History.*
"The American Indian." Clark Wissler, Curator of Anthropology, American Museum of Natural History.
"Education and the American Philosophical Society." Merle M. Odgers, President, Girard College.
"Early French Members." Gilbert Chinard, Professor of French Literature, Princeton University.

ANNUAL GENERAL MEETING, APRIL 23, 24, 25, 1942

RECENT ADVANCES IN AMERICAN ARCHAEOLOGY

Thursday, April 23, 10:00 A.M.

ROLAND S. MORRIS, President, in the Chair

"The Problem of the Eskimo." Aleš Hrdlička, Curator, Division of Physical Anthropology, United States National Museum.
"Eskimo Archaeology and its Bearing on the Problem of Man's Antiquity in America." Henry B. Collins, Jr., Senior Ethnologist, Bureau of American Ethnology, Smithsonian Institution.
"Cave and Lake Bed Cultures of South Central Oregon, in the Northern Great Basin." L. S. Cressman, Professor and Head, Department of Anthropology, University of Oregon.
"Discoveries in Sandia Cave and Early Horizons in the Southwest." Frank C. Hibben, Assistant Professor of Anthropology and Curator, Museum of the University of New Mexico.
"Folsom and Yuma Problems." Edgar B. Howard, Vice-Director, University Museum, University of Pennsylvania.
"A Possible Cochise-Mogollon-Hohokam Sequence." Emil W. Haury, Head, Department of Anthropology, University of Arizona. (Read by Dr. Hibben.)
"The Reconstruction of Anasazi History." Harold S. Colton, Director, Museum of Northern Arizona.
"Archaeology of the Plains." William Duncan Strong, Associate Professor of Anthropology, Columbia University.

Thursday, April 23, 2:00 P.M.

WILLIAM E. LINGELBACH, Vice-president, in the Chair

"Chronology in the Middle West." Fay-Cooper Cole, Professor and Chairman, Department of Anthropology, University of Chicago.
"Early Horizons in the Southeast." William S. Webb, Professor and Head, Department of Anthropology and Archaeology, University of Kentucky.

"Late Horizons in the Southeast." T. M. N. Lewis, Tennessee State Archaeologist; Professor and Head, Department of Archaeology, University of Tennessee.

"Recent Advances in New York State and the Northeast." William A. Ritchie, Archaeologist, Rochester Museum of Arts and Sciences. (Read by title.)

"The Effect of the Abbott Farm on Eastern Chronology." Dorothy Cross, Department of Sociology and Anthropology, Hunter College.

"The Aztecs: Their Cultural and Historical Position in Middle American Archaeology." George C. Vaillant, Director, University Museum, University of Pennsylvania.

"Archaeology of the Andean Field." Wendell C. Bennett, Department of Anthropology, Yale University.

Thursday, April 23, 8:15 P.M.

FAY-COOPER COLE in the Chair

FRANKLIN MEDAL LECTURE

"The Carnegie Institution's Work in Central America and Mexico." Sylvanus Griswold Morley, Associate of the Carnegie Institution of Washington.

The Lecture was followed by round table parties.

Friday, April 24, 1:30 P.M.

EDWIN G. CONKLIN, Vice-president, in the Chair

"Variable Stars and the Sources of Stellar Energy." Cecilia Payne Gaposchkin and Sergei Gaposchkin, Astronomers, Harvard College Observatory. (Read by Dr. Shapley.)

"The Columelle Auris and the Sense of Hearing in the Primitive Extinct Amphibia and Reptilia." Ermine C. Case, Professor Emeritus of Historical Geology and Paleontology, University of Michigan.

"Selachine as a Color Neurohumor in Sharks." G. H. Parker, Professor Emeritus of Zoology, Harvard University.

"Nine Strikingly Diverse Types in Datura with Location of Their Determiners in a Single Chromosome." Albert F. Blakeslee and A. G. Avery, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor.

"New Mutations and Mutational Segregations from Oenothera Lamarckiana." George H. Shull, Professor of Botany and Genetics, Princeton University.

"The Influence of Immunity on the Asexual Reproduction of the Malarial Parasite." William H. Taliaferro, Professor of Parasitology, University of Chicago, and Lucy Graves Taliaferro.

"A Cancerous Neoplasm of Plants Produced by Autonomous Bacteria-free Crown-gall Tissue." Philip R. White, Associate, Rockefeller Institute for Medical Research, Princeton. (Introduced by Dr. Conklin.)

"The Importance of Physiologic Specialization in Puccinia graminis tritici, Stem Rust of Wheat." Elvin C. Stakman, Chief, Division of Plant Pathology and Botany, University of Minnesota; Agent, United States Department of Agriculture.

Friday, April 24, 5 P.M.

INITIAL BROADCAST OF
THE AMERICAN PHILOSOPHICAL SOCIETY
OVER STATION W R U L

"Introduction." Edwin G. Conklin, Newly elected President of the American Philosophical Society.

"Science and War." Robert A. Millikan, Director, Norman Bridge Laboratory of Physics, Chairman, Executive Council, California Institute of Technology.

"The American Philosophical Society and the World Wide Broadcasting Foundation." Walter S. Lemmon, Founder and President of WRUL.

"Inaugural Program of the American Philosophical Society over Station WRUL." Sir Angus Fletcher, World Wide Broadcasting Foundation.

Announcer: Roland S. Morris, Retiring President of the American Philosophical Society.

Immediately after the broadcast a reception was held for members and invited guests.

Friday, April 24, 8:30 P.M.

Roland S. Morris, President, in the Chair

THE R. A. F. PENROSE, JR., MEMORIAL LECTURE

"The Problem of Education in a World at War." James R. Angell, President Emeritus, Yale University; Educational Counselor, National Broadcasting Company.

The Lecture was followed by a reception.

Saturday, April 25, 9:30 A.M.

Frank Aydelotte, Vice-president, in the Chair

"Invention and Intervention." Harrison S. Morris.

"Religious Attitudes of the Ancient Greeks." Arthur Darby Nock, Professor of the History of Religion, Harvard University.

"Two Studies in Syncretistic Amulets: (1) A Love Story in Stone. (2) A Byzantine Medal." Campbell Bonner. Professor of Greek, University of Michigan.

"Sardinian Pre-history and the Recent Excavations." Doro Levi, Member, Institute for Advanced Study. (Introduced by Dr. Holland.)

"Irish Backgrounds of Colonial Enterprise." Howard M. Jones, Professor of English, Harvard University.

"A Study of the Distance Factor in Social Relations." John Q. Stewart, Associate Professor of Astronomical Physics, Princeton University. (Introduced by Dr. Russell.)

"Testing Public Opinion." George H. Gallup, Director, American Institute of Public Opinion. (Introduced by Dr. Eisenhart.)

"An International Bill of Rights." William Draper Lewis, Professor of Law, University of Pennsylvania; Director, American Law Institute. (Introduced by President Morris.)

"The Duchesne River Oligocene of Utah"; Presentation of Completed Monograph on White River Fauna. William B. Scott, Professor Emeritus of Geology and Paleontology, Princeton University.

Saturday, April 25, 2 P.M.

Immediately after luncheon, members and guests were taken on a trip to Fairmount Park where they visited colonial houses at Mount Pleasant and Cedar Grove and were received by Mr. Fiske Kimball, President of the Philadelphia Museum of Art. After the tour a reception was held at the home of Mr. and Mrs. Charles F. Jenkins, Germantown.

Saturday, April 25, 7:30 P.M.

The annual dinner was held at the Bellevue-Stratford Hotel, President Morris presiding.

Judge Herbert F. Goodrich presented the Henry M. Phillips Prize of fifteen hundred dollars and diploma to Professor Edward S. Corwin, Princeton University, for his work on the science and philosophy of jurisprudence culminating in his book on *The President: Office and Powers* and his articles on "American Constitutional Law." Professor Corwin made a brief response in acceptance of this honor.

The following after-dinner addresses were made:

Charles K. Webster, London School of Economics. "Uniting the United Nations."
Roland S. Morris, Retiring President, American Philosophical Society. "The American Philosophical Society."

AUTUMN GENERAL MEETING, NOVEMBER 20, 21, 1942

Friday, November 20, 10 A.M.

SYMPOSIUM ON THE EARLY HISTORY OF SCIENCE AND LEARNING IN AMERICA [1]

WILLIAM E. LINGELBACH, Vice-president, in the Chair

"Rafinesque's Publications from the Standpoint of World Botany." E. D. Merrill, Professor of Botany, Administrator of Botanical Collections, Harvard University.
"Horatio Gates Spafford, Precursor of Bessemer." Julian P. Boyd, Librarian, Princeton University.
"History of Physical Anthropology in America with Special Reference to Philadelphia." Aleš Hrdlička, Curator, Division of Physical Anthropology, United States National Museum.
"Early History of Political Economy in America." Frank A. Fetter, Professor Emeritus of Political Economy, Princeton University.
"American Georgian Architecture." Thomas Jefferson Wertenbaker, Professor of American History, Princeton University.

Friday, November 20, 2 P.M.

EDWIN G. CONKLIN, President, in the Chair

"American Historical Writings in Our Earlier and Later History: A Critical Analysis." Richard M. Shryock, Professor of American History, University of Pennsylvania; President of the History of Science Society.
"Early Studies of Mediterranean Archaeology." William B. Dinsmoor, Professor of Archaeology, Columbia University.
"Notes on Early American Work in Linguistics." Franklin Edgerton, Professor of Sanskrit and Comparative Philology, Yale University.
"Europe and American Art." A. Hyatt Mayor, Acting Librarian and Associate Curator of Prints, Metropolitan Museum of Art.

[1] See p. 48.

Friday, November 20, 8:15 P.M.

EVENING LECTURE

"The Philosophy of Government in Our Earlier and Later History." John Dickinson, General Counsel, Pennsylvania Railroad; Professor of Law, University of Pennsylvania.

The Lecture was followed by a reception.

Saturday, November 21, 10:30 A.M.

EDWIN G. CONKLIN, President, in the Chair

"A Study of the Orbital Motion of the Double Star 61 Cygni." K. Aa. Strand,* Research Associate, Sproul Observatory, Swarthmore College.

"The Mammalian Fauna of the Duchesne River." William B. Scott,* Professor Emeritus of Geology, Princeton University.

"The Geological Work of the Glacial Anticyclone Around Continental Glaciers." William Herbert Hobbs, Professor Emeritus of Geology, University of Michigan.

"Plant Colonization Problems on Anthracite Mining Wastes." J. R. Schramm, Professor of Botany, Director, Department of Botany, Director, Morris Arboretum, University of Pennsylvania.

"Potato Witches' Broom; Transmission by Dodder and Cure by Heat." Louis Otto Kunkel, Member, Rockefeller Institute for Medical Research, Princeton.

"The Höffding Function in Perception and in Recall." Wolfgang Köhler,* Professor of Psychology, Swarthmore College.

Saturday, November 21, 2 P.M.

FREDERICK P. KEPPEL, Vice-president, in the Chair

"Individual, Family, Population, and Race." Franz Boas,* Professor Emeritus of Anthropology, Columbia University.

"The Historical Significance of 'L'Aiglon.'" Friedrich Engel-Janosi,* Visiting Professor, Catholic University of America.

"Benjamin Franklin's Mortgage on Daniel Boone's Farm." J. Bennett Nolan, Attorney-at-Law.

"An Inexhaustible Source of Linguistic Knowledge." Arthème A. Dutilly,* Research Associate in Biology, Catholic University of America; Naturalist of the Oblate Arctic Missions.

* Recipient of Grant from the Research Funds.

THE AMERICAN PHILOSOPHICAL SOCIETY'S BROADCASTS

April to August

As a contribution of the American Philosophical Society to mutual understanding and intellectual fellowship among the United Nations in this World wide war, the Committee on Finance recommended to the Council and the Council to the Society that $25,000 be appropriated from the $100,000, assigned in the budget for 1942 to the Committee on Research for a series of short-wave broadcasts from the Hall of the Society to the English-speaking world over Station WRUL of the World Wide Broadcasting Foundation.

A Committee was appointed to select speakers and topics and to make arrangements for the broadcasts, consisting of the following persons: Edwin G. Conklin, Roland S. Morris, Harlow Shapley, W. F. G. Swann and Luther P. Eisenhart.

The broadcasts began on Friday, April 24, during the Annual Meeting [1] of the Society and were continued every Friday thereafter until July 31. Each broadcast opened with the strokes of the bell in the tower of Independence Hall which is a replica of the original Liberty Bell and bears the same inscription: "Proclaim Liberty throughout all the land, unto all the Inhabitants thereof." This was followed by a brief historical reference to Independence Square and Hall, the American Philosophical Society, and the present significance of the message of the Liberty Bell.

It was found more convenient to give a few of the broadcasts from the offices of the World Wide Broadcasting Foundation in New York or Boston; the others were given from the Lecture Hall of the Society. Invitations to these were issued and each of them was followed by a reception.

The following is a list of the broadcasts:

April 24. Introductory Program. Edwin G. Conklin, Robert A. Millikan, Walter S. Lemmon, Sir Angus Fletcher and Roland S. Morris.

May 1. An International Bill of Rights. William Draper Lewis, Director, American Law Institute.

May 8. Internationalism of Science. Harlow Shapley, Director, Harvard College Observatory.

[1] See p. 52.

May 15. The Smithsonian Institution as an Illustration of Internationalism in Science. Charles G. Abbot, Secretary, Smithsonian Institution.

May 22. Atmospheric Electricity and Allied Phenomena. W. F. G. Swann, Director, Bartol Research Foundation of the Franklin Institute.

May 29. Cosmic Rays—What They Are and What They Mean. Robert A. Millikan, Director, Norman Bridge Laboratory of Physics, Chairman, Executive Council, California Institute of Technology.

June 5. The Federal Idea, Especially as It Has Evolved in the United States. Edward S. Corwin, Professor of Jurisprudence, Princeton University.

June 12. The Interest of Labor in the Preservation of Democracy. Spencer Miller, Jr., Director, Workers Educational Bureau.

June 19. International Scholarships and Fellowships. Frank Aydelotte, Director, Institute for Advanced Study, Princeton.

June 26. International Law. Philip C. Jessup, Professor of International Law, Columbia University.

July 3. Victory and Peace. Francis Biddle, Attorney General of the United States.

July 10. Research Laboratories in Industries. O. E. Buckley, President, Bell Telephone Laboratories.

July 17. The Resources of the Continents. Kirtley F. Mather, Head, Department of Geology, Harvard University.

July 24. The Mood of America. George Gallup, Director, American Institute of Public Opinion.

July 31. Review of the American Philosophical Society's Broadcasts, April 24 to July 31. Edwin G. Conklin, President, American Philosophical Society.

The broadcasts on scientific subjects were printed in *Science* and noticed in *Nature*, and all of them were of a high order of excellence; those on political and social themes connected with the war were especially appreciated by our allies in Great Britain and Australia. The American Philosophical Society is deeply indebted to all who contributed to these broadcasts for their generous cooperation in this effort of the Society to interpret to people in other lands the "Mind of America," and to keep alive the flame of science and learning amidst the general "blackout" of the war.

In keeping with the history and traditions of the Society, it was decided that these broadcasts should be of a scholarly character rather than mere propaganda and as such they dealt more with aims and conditions of peace than with means of winning the war. One can think of scarcely any other setting for such messages that would be more inspiring to people in their struggles for liberty and justice than this historic place; and the broadcasts themselves, beginning with the sound of the bell proclaiming liberty throughout the land and proceeding to an account of some of the aims and results of intellectual and social liberty were examples of what we are fighting for. The philosophic spirit of this Society and its interpretation of what is meant by "civilization" is nowhere better shown than in the last section of its Charter which was adopted in 1780 in the midst of the seven year War for Independence and which reads: "Nations truly civilized (however unhappily at variance on other accounts) will never wage war with the Arts and Sciences and the common Interests of humanity." The American Philosophical Society continues to cherish such ideals of civilization.

After fifteen of these broadcasts had been given, it was decided to postpone them until after August and September, and then to go on with another series until the end of the year. Programs had been arranged and speakers engaged for a number of these broadcasts when all short-wave stations were taken over by the Government and the Society's program suspended, at least for the present. Whether they will be resumed has not yet been decided.[1] About one-half of the sum appropriated for these broadcasts has been expended, almost all of it in payments to the World Wide Broadcasting Foundation.

MEETINGS OF OTHER ORGANIZATIONS

THE ARCHAEOLOGICAL INSTITUTE OF AMERICA, PHILADELPHIA SOCIETY

April 15, 8:15 P.M. Thomas R. S. Broughton, "A Review of M. I. Rostovzeff, The Social and Economic History of the Hellenistic World."

James B. Pritchard, "Identifications of the Figure of Palestinian Figurines."

[1] See p. 42.

Edith Hall Dohan, "Archaeological Evidence of an Etruscan Invasion of Italy."

December 10, 8:15 P.M. Dorothy Kent Hill, "Ancient Bronze Sculpture in America."

THE JAYNE MEMORIAL LECTURES

The Jayne Memorial Lectures for the season of 1942 were presented by Samuel N. Kramer, Research Fellow, University Museum, University of Pennsylvania, on the subject of "Sumerian Mythology: A Study of Spiritual Achievement in the Third Millennium B.C." viz:

April 9, 8:15 P.M. "The Sources: The Sumerian Tablets Dating Approximately 2000 B.C."

April 16, 8:15 P.M. "Outlines and Analyses of the More Significant Sumerian Myths."

AWARD OF THE JOHN SCOTT MEDAL AND PREMIUM

Presented by the Board of Trusts of the City of Philadelphia.

October 15, 8:30 P.M. Vice Admiral Samuel Murray Robinson, Chief, Naval Office of Procurement and Material, for outstanding work in warship design and construction.

Albert Hoyt Taylor, Chief Physicist, Naval Research Laboratory, for important researches in the application of radio to naval purposes.

American Council of Learned Societies—January 30, 31; September 25, 26, 27; October 8; December 17.

Philadelphia Bibliographical Center and Union Library Catalogue, Executive Board—April 4.

Social Science Research Council—September 14, 15, 16.

Conference on International Law—October 17, 18.

American Law Institute—November 5, 6, 7.

American Philological Association—December 29.

One of the results of the Committee on Education and Participation in Science has been the organization of the Philadelphia Council of Amateur Scientists. Several meetings of this group were held in the Hall during the year.

2. REPORT OF THE COMMITTEE ON HALL

The Committee on Hall for the year 1942–43 consists of the following members: John Story Jenks, *Chairman,* Paul P. Cret, Leicester B. Holland, Marshall S. Morgan, Lawrence J. Morris, Francis R. Packard, John M. Scott, and *ex-officio,* Edwin G. Conklin, *President;* Albert P. Brubaker, *Curator;* and Luther P. Eisenhart, *Executive Officer.*

During the year 1942 two meetings of the Committee on Hall were held on January 24 and April 17, as well as a number of informal meetings of the Chairman and members of the Committee, and the President. The meetings of the Committee were concerned chiefly with providing greater safety for the building and the principal treasures of the Society in time of war. The top story of the building was made safer by the removal of the remaining library books to an additional room which was rented in the Drexel Building and by tearing out all the remaining wooden shelves; also by installing sand boxes and shovels as well as anti-incendiary pumps. Similar provision of sand in buckets, shovels, pumps and fire extinguishers were made on all floors. Expert estimates were obtained of the approximate value of our principal works of art and of our most notable manuscript collections. These estimates together with the sentimental value that the Society places on some of these items, constituted the basis of the selection of items to be removed from the Hall and Library to places of greater safety. Twelve of the most valued portraits and eleven busts were carefully packed by skilled men under the direction of Mr. Henri Marceau, Director of the Philadelphia Art Museum, and removed to a safe place in the country where they are under constant guard. Eight portraits which needed expert attention have been skillfully restored. Portraits and busts remaining in the Hall have been redistributed so that the rooms are not left bare of ornaments.

The most valuable historic documents, including the great collection of Franklin Papers were carefully boxed and placed in a safe deposit which is considered the freest from danger of any in Philadelphia, and yet where they may be reached on short notice if that should be necessary. Special insurance and guards were pro-

vided during transfer, also special war insurance on the building and contents was taken out.

It is a pleasure to report that at long last the entrance to the Hall from Independence Square is being greatly improved by replacing the old cast-iron steps by marble platform and steps in harmony with the Colonial Architecture of the Square, and by regrading and relaying the walks leading to these steps. Also the walk around the south side of the Hall has been regraded and an adequate drain has been installed to carry off surface water and prevent the leakage into the basement of the building after heavy rains. The side-walk on the Fifth Street side of the building has been relaid in connection with the restoration of the walks all around Independence Square. The restoration of the entrance to "Philosophical Hall" from the "State House Yard" makes it as it was in the beginning, the dignified Front Door for all formal occasions, the entrance from Fifth Street remaining as the usual and every-day entrance.

The Committee deeply appreciates the skill and interest of the architect, Mr. Thomas Pym Cope, in designing and supervising these improvements and the hearty cooperation of Mr. H. W. Murphey, Chief of the Bureau of City Property, and his staff in regrading and relaying the walks and installing the drains.

Immediately after the meeting of the Committee on April 17 the following natural history specimens were transferred from the top floor of the Hall to the Academy of Natural Sciences of Philadelphia:

1 plaster cast skeleton of Plesiosaurus Dolichodarius.
1 enormous calcareous sponge.
1 pair water buffalo horns.
1 skull and antlers of white-tailed deer.

3. REPORT OF THE COMMITTEE ON THE LIBRARY

The Committee on the Library has the honor to present the following report for the calendar year 1942.

The Library Committee: Personnel, Meetings, and Policy.

The Committee consists of William E. Lingelbach, *Chairman,* Rhys Carpenter, J. Percy Moore, Horace C. Richards, A. S. W. Rosenbach, St. George L. Sioussat, and *ex-officio,* Edwin G. Conklin, *President,* and Luther P. Eisenhart, *Executive Officer.*

It is with a deep sense of sorrow that the Committee notes the death, on June 28, 1942, of Dr. George A. Barton who served many years on its membership.

Four regular meetings of the Committee, and one joint meeting with the Committee on Hall, were held during the year, namely, on January 24, February 12, May 20, October 21, and December 16.

The beginnings of the Library of the American Philosophical Society are somewhat obscure, but there is ample evidence that its origins date back to the early years of the amalgamation of the two societies (in 1769). On February 4, 1774, an entry in the minutes suggests one interesting group of accessions from abroad which many libraries of today would appreciate. It reads:

> "Books sent with a letter from Franklin:—(1.) The Compt of Buffon's Nat. Hist. of birds, with coloured plates from the author, 4 Vols. F°—(2.) Trans. R. S. London, 3 Vols.— . . . (15.) Bayley's advancement of the Arts."[1]

During the Revolution, the Library was scattered, most of the books being removed for safety by the then librarian, David Rittenhouse, to his home in the country. In the years immediately following, the Library apparently received very little attention. The Manuscript Catalogue of 1799 lists only a few hundred titles. Four years later in 1803, John Vaughan, the brother of Franklin's close friend, Benjamin Vaughan, succeeded Rittenhouse, and during his librarianship, the Library expanded rapidly. With the help of Peter Stephen Du Ponceau, George Ord, and especially President Jefferson, particular attention was given to American

[1] Early Minutes, Amer. Philos. Soc. Proc. 22: pt. 3, 88 (1884).

history and Americana. As noted in the brief catalogue of selected manuscripts and printed documents of the Society, published in 1937, it was through Thomas Jefferson's "interest that the Society became possessed of many of its American Indian vocabularies, the Journals of the Lewis and Clark Expedition, and the Secret History of the Dividing Line by William Byrd of Westover." Shortly before his death, Vaughan through the assistance of Jared Sparks also secured the great collection of Franklin Papers as a gift from the heirs of George Fox with whom they had been left by William Temple Franklin, the literary legatee of Franklin. These have since been augmented by new acquisitions year by year notably in the purchase of the Bache Collection of some 1,100 items in 1936.

At the same time the Library, as distinct from the archives, also expanded through purchase and gifts, the continued popularity and influence of Franklin abroad coupled with the exchange of the Society's TRANSACTIONS and PROCEEDINGS accounting for the relatively large numbers of serial publications of European scientific and learned societies. This aspect of the Society's exchange policy in the early days, and Franklin's part in it, appears clearly in the following curt entry in the minutes of the meeting on October 18, 1771:

> "Franklin's letter, that he had received a box of eleven copies of Trans. & had delivered most of them. Ordered that the copies designed for Foreign Socs. & Universities be sent without loss of time to Dr. Franklin."[1]

The Library of the Society has always been more or less highly specialized, though not apparently because of any consistent policy. To clarify the situation a Special Committee on Library was appointed to study the library problem. The four members of that Committee were not only prominent scholars in their respective fields of science and history, but also in library and archival administration. In their Report, submitted to the Society and adopted at the Annual Meeting in April 1941, they emphasize the need, first, of planned specialization; second, of coordination of the Library's holdings with those of other libraries of the Philadelphia metropolitan area; and third, of the sale or removal of non-essential holdings, especially of serials. In these suggestions the Committee

[1] *Ibid.*, p. 66.

formulated certain major trends in library and archival administration which are today being accepted by scholars and libraries as axiomatic.

Meanwhile the mandate of the Society to the Library Committee and the librarian to develop a constructive policy in accord with the recommendations is clearly expressed in the resolution of the Society on April 1941:

"*Resolved,* that the Library Committee be urged, in selecting fields and subjects for cultivation, to insist even more rigidly than in the past upon choosing those capable of development to a point of superiority. . . ."

The problem of selecting the field or fields "capable of development to a point of superiority" is, however, exceedingly difficult. In order to arrive at a selection in so important a matter, a variety of factors, some of them purely local in character, have to be considered. Foremost among these are,—certain traditions and concerns of the Society throughout the two centuries of its history, traditions closely associated not alone with a deep interest in research but also with the synthesis of its results and hence "the promotion of useful knowledge"; the fact that the Library holdings are fairly strong in a few fields and weak and inadequate in others; and, finally, the existence of library conditions peculiar to the Philadelphia metropolitan area. Fortunately, the means for an understanding of these conditions, and the bases for intelligent cooperation have been developed by the establishment of the Philadelphia Metropolitan Library Council and the Philadelphia Bibliographical Center and Union Library Catalogue.

Based on surveys made by the staff of the Library's holdings and those of other institutions of the Philadelphia area, the Library Committee is convinced of the soundness of the policy indicated in the Report of last year, that is, of selecting the history of American science and culture as one of the two or three major fields in which the Library should develop its holdings. The importance of the field is not only obvious, but it is also one in which the Society has a special competence. Furthermore, it is not, save in a few subjects, one that has received particular attention by the libraries of Philadelphia. Even in this more restricted field, however, the close cooperation with the Academy of Natural Sciences should be continued. It would be unwise, for example, for the

Society to build up its modest section on ornithology, a subject already very well cared for by the admirable collection in the Library of the Academy. Similarly, the history of medicine and surgery can be omitted by us because of the excellent collections on these subjects at the Library of the College of Physicians. An illustration of the kind of study and inter-library cooperation that is in progress to implement and carry out the mandate of the Society is seen in the Report of Dr. J. Percy Moore on the Library's holdings on zoology and allied subjects.[1]

Another practical step in this direction is the study by a committee composed of Dr. Conklin, Dr. Moore, and the librarian of the possibility of building up a really great collection on the history of evolution, including its acceptance in this country and its rôle as a great unifying principle in the intellectual and scientific life of our age. At the same time, other aspects on the history of science in this country have been given special attention, as seen below in the account given of the acquisitions of Thomas Say, J. Peter Lesley, and Benjamin Smith Lyman manuscripts. Their acquisitions by the Society reflect a welcome continuance of a tradition so happily begun with the gift of the great collection of Franklin Papers noted above, and again manifested by the acquisition several years ago of the voluminous papers of the late Elihu Thomson.

As to the other fields to be included in the plan for a specialized library, no decisions have been reached. Tentatively, that of archaeology and early civilizations has been discussed. The strength of our holdings in this field, coupled with the existence of the Phillips and other funds, the income of which is earmarked for purchases in these subjects, are strong arguments in its favor. Incidentally, there is in this field an excellent opportunity of correlating our accessions with the rich source materials of the University of Pennsylvania Museum. Certain aspects of husbandry and of conservation, subjects becoming constantly more important in our national economy, have been proposed. They represent a field that appears to be very much neglected by the other libraries of the city. Our own Library, on the contrary, has valuable, though highly specialized, materials in this field dating from the lively interest in the subject by President Jefferson and the

[1] See p. 240.

Michauxs. Indeed the existence of the Michaux Fund devoted to the purchase of books in this field makes the continuation of the policy both logical and practical.

Another field closely integrated with our archival collections that has been frequently advocated, especially by members of groups III and IV of the Society's membership, relates to diplomatic history. It is a field in which the interests and achievements of both Franklin and Jefferson are so outstanding that continued recognition of it would seem not only reasonable but almost imperative. Perhaps, the biographical aspects might be given special attention, again a subject largely neglected by the libraries in this area. In the meantime, the lively interest of the Society in Frankliniana is, of course, being maintained. During the past year, a number of rare items were bought, and negotiations are in progress for the purchase of others.

The new collections of manuscripts, acquired since the last Report, have been given prompt attention as noted below. The papers have already been arranged either chronologically or topically. Most of the individual items have been pressed and placed in folders which in turn are brought together, in strong cartons, properly labeled as to contents. In other words, they are not only preserved and recorded, but made available for consultation and use. As opportunity occurs, the question of more detailed calendaring of the important items will have to be considered. Certainly, no efforts will be too great to see to it that books and manuscripts that find their way into the custody of the Society will be conserved and prepared for use.

Accessions.

In line with the policy which is being developed, we have been fortunate this year in procuring, by gift and purchase, several important collections of manuscripts which, along with the many items of historical significance in the Society's archives, will go far toward forming a nucleus around which to build a depository for source material in the history of science and culture in America.

From Mr. Charles Lesley Ames came a collection of Peter Lesley Papers consisting of about 3,000 items, covering the years 1838–1893. Peter Lesley (better known as J. Peter Lesley) was director of the Second Geological Survey of Pennsylvania. He was a member of the American Philosophical Society from 1856 until his

death in 1903, serving as librarian from 1858 to 1885, secretary from 1859 to 1887, and vice-president from 1887 to 1898. The bulk of the collection comprises letters to and from Peter Lesley and his wife, Susan Inches Lesley. Other items include diaries and reports of the Geological Survey, private reports on coal fields, and miscellaneous writings and notebooks. Although the correspondence is chiefly scientific, many letters pertain to the questions of slavery and abolition, education and reform, organized charity, and Unitarianism. Among the correspondents were Leo Lesquereux, Edouard Desor, Henry D. Rogers, James Freeman Clarke, Phillips Brooks, Ralph Waldo Emerson, Horace Greeley, and Edward Everett Hale.

A second collection, largely geological in content, is the Benjamin Smith Lyman Papers, numbering some 6,000 items, covering the years 1850–1918. Mr. Lyman, a geologist and mining engineer, and nephew of the above-mentioned Peter Lesley, was a member of this Society from 1869 until his death in 1920, being curator from 1896 to 1901. He is perhaps best known for his work as chief geologist and mining engineer to the Japanese government from 1873 until 1879. It was during those years that he conducted the famous geological survey of Hokkaido. Drafts of much of the correspondence and reports made in connection with that Survey are in the collection. In addition there are reports on the oil lands of Punjab, on various coal lands in the eastern parts of the United States, as well as many philological writings, and the voluminous notes made for his *Vegetarian Diet and Dishes*.[1] This collection was deposited by the Academy of Natural Sciences of Philadelphia.

Dr. Walter B. Cannon presented a group of 658 items, chiefly his correspondence with Dr. W. W. Keen, former president of the Society, during the period 1905–1928.

The General Electric Company added 54 letter box files, 1891–1923, to the Elihu Thomson Papers.

In addition to these gifts, 34 letters from George Ord to Charles Waterton, the English naturalist, were purchased. These were written during the years 1832–1858, and contain many comments on contemporary naturalists, such as Audubon, Nuttall, Maclure, Titian Peale, Charles Lucien Bonaparte, and Cuvier. Several

[1] Philadelphia, 1917.

references were made also to the American Philosophical Society, as the letters cover the period during which Ord served as librarian.

A volume of Thomas Say material was acquired which contains numerous manuscript notes on conchology by Say, about 200 of the original drawings made by Mrs. Lucy Say and Charles A. Lesueur for his *American Conchology*,[1] and several letters.

In addition to the important current printed works in the history of science, several early items were acquired, among these are: Petrus Apianus, *Cosmographicus Liber*, first edition, published in 1524; Antoine César Becquerel, *Résumé de l'Histoire de l'Électricité et du Magnétisme*, Paris, 1858; Euclides, *Elements*, first Greek edition, published in Basle, 1533; Johann Kepler, *De Stella Nova*, Pragae, 1606; and Antoine Laurent Lavoisier, *Mémoires de Chimie*, V. 1, 2 and 4 [all published], Paris, 1805.

In conformity with the effort being made to build up biographical works in the fields of American scholarship and science, the following titles were added: *Cyrus Adler*, by A. A. Neuman; *Amos Eaton, Scientist and Educator*, by Ethel M. McAllister; *Willard Gibbs*, by Muriel Rukeyser; two works on Thomas Jefferson, one by Bernard Mayo, and the other by Saul K. Padover; the autobiography of David Starr Jordan, *The Days of a Man; Torch & Crucible, the Life and Death of Antoine Lavoisier*, by Sidney J. French; *Edward Sylvester Morse*, by Mrs. Dorothy G. Wayman; *The Life of Ira Remsen*, by Frederick H. Getman; Andrew D. Rodgers' two works, *"Noble Fellow" William Starling Sullivant* and *John Torrey;* and *William Henry Welch*, by Simon Flexner.

The Franklin Collection was augmented by the purchase of two holograph letters of Dr. Franklin—one to Josiah Quincy, April 8, 1761, and the other to Jonathan Williams, sr., January 13, 1772, and photostats of nine items, 1777–1785, including three letters from Dr. Franklin to Benjamin Vaughan, presented by Mrs. Mary Vaughan Marvin, a descendant of John and Benjamin Vaughan. Dr. Harry M. Lydenberg, Director of the Biblioteca Benjamin Franklin, Mexico City, sent a photograph of a plaster bust of Franklin which was made by Ramiro Gaviño and presented to that Library in May 1942.

Other accessions of interest include eleven Joseph Priestley titles; a broadside pertaining to a meeting "at the Philosophical Society's hall" on June 10, 1774, in connection with the Boston

[1] New Harmony, Ind., 1830–1834.

Port Bill; a letter from John Quincy Adams to Peter S. Du Ponceau, September 18, 1829, mentioning the Society; a manuscript opinion book of the Law Academy of Philadelphia, kept by P. S. DuPonceau, 1820–1822; and microfilms of a manuscript journal by Christian Frederick Post, April 1 to June 30, 1760, and "Observations on the Soil and Climate of East Florida, 1822," by John Eatton LeConte.

The following manuscript items have been withdrawn from the Society's holdings during the year: the "Montezuma Tribute Roll,"[1] the "Life and Writings of James Wilson," by Burton Alva Konkle, and "David Lloyd," by the same author.

Curtailment of material from Axis-controlled countries, and hazardous transportation again have reduced the number of serial titles received, bringing the number in 1942 down to 438 by exchange, 142 by gift, and 175 by purchase. Among the more important new titles are: *Applied Anthropology*, the *Middle American Research Series,* published by the Middle American Research Institute of Tulane University, and *Yale Anthropological Studies.*

In summing up the year's accessions, there have been added 1,227 volumes of which 959 were serials, 275 pamphlets, 24 maps, 1 broadside, 2 microfilms, 13 photostats, 429 prints and engravings, and 753 manuscripts in addition to the Peter Lesley and Benjamin Smith Lyman Collections. Of these there have been acquired by gift or exchange 861 volumes of which 743 were serials, 260 pamphlets, 11 photostats, 24 maps, 2 prints and engravings, and 713 manuscripts.

At the close of 1942 the total number of volumes in the Library is 102,674 (of which 71,297 are serial publications), of pamphlets 37,746, and of maps 5,832. The corresponding figures at the close of 1941 were: 101,447 volumes (of which 70,338 were serials), 37,741 pamphlets, and 5,808 maps.

The Committee wishes to acknowledge the receipt of gifts from the following persons and institutions: Randolph G. Adams, William F. Albright, Amerind Foundation, Inc., Charles Lesley Ames, Edward C. Armstrong, Eva V. Armstrong, Association of American Railroads, Baltimore Municipal Museum, Leon H. Barnett, Biblioteca Benjamin Franklin, California Department of Agriculture, Walter B. Cannon, Carnegie Endowment for International Peace, Carnegie Institution of Washington, Melchor Centeno-Graü,

[1] See p. 35.

Gilbert Chinard, Colgate University, College of Physicians, Conference on Science, Philosophy and Religion, Edwin G. Conklin, William S. Cooper, Cornell University, James H. R. Cromwell, Cuerpo de Ingenieros de Minas del Peru, Max Farrand, Folger Shakespeare Memorial Library, Francis A. Foster, General Motors Corporation, Geographical Society of New South Wales, Lawrence H. Gipson, Girard College, H. M. Stationery Office, Sir Philip Hartog, Cheesman A. Herrick, Historical and Philosophical Society of Ohio, Alban W. Hoopes, Marian Sadtler Hornor, Aleš Hrdlička, Mary Churchill Humphrey, Institut Adrien Guébhard-Séverine, Instituto Panamericano de Bibliografia y Documentacion, Instituto y Observatorio de Marina, Indian Rights Association, Charles F. Jenkins, John Story Jenks, J. Jijon y Caamano, John Carter Brown Library, Joint University Libraries of Nashville, Kentucky Sesquicentennial Commission, Laboratoire de Plasmogénie of Mexico, Harry H. Laughlin, William Draper Lewis, Library Company of Philadelphia, Fred Lockley, Harry M. Lydenberg, Edward L. Mark, Mrs. Mary Vaughan Marvin, Charles E. K. Mees, Mexican-American Institute of Cultural Relations, Microfilms, Inc., Milbank Memorial Fund, Willis I. Milham, Montana Academy of Sciences, Roland S. Morris, Museum of Modern Art, Abraham A. Neuman, New York Meteorological Observatory, New York Zoological Society, Francis R. Packard, Samuel White Patterson, Peabody Museum of Salem, Commonwealth of Pennsylvania, Pennsylvania Federation of Historical Societies, Pennsylvania Forestry Association, Pennsylvania Historical Commission, Pennsylvania State College, Penrose Research Laboratory, Philadelphia Bibliographical Center and Union Library Catalogue, Philadelphia Museum of Art, Polish Roman Catholic Union, J. G. Randall, Rhode Island Historical Society, Horace C. Richards, Rockefeller Foundation, Royal Observatory of Greenwich, J. Henry Scattergood, Social Science Research Council, Sociedad de Estudios Astronomicos y Geofisicas, Society for Research on Meteorites, Alexander J. Stoddard, Hellmut de Terra, Alfred M. Tozzer, Union Catalogue of Floridiana, United States Government, Universidad Nacional de Mexico, University of Pittsburgh, University of Texas, Vermont Historical Society, Virginia State Library, Herbert E. Winlock, Woods Hole Oceanographic Institute, World Calendar Association, Yiddish Scientific Institute, Yorktown Colonial National Historical Park, Zoological Society of Philadelphia.

Binding, Cataloguing, etc.

During 1942, 680 volumes have been bound. There have been catalogued 297 titles in 352 volumes; 702 serial analytics have been brought out; 119 association items. 25 autographs, 13 broadsides, 4 bookplates, and 198 pre-1800 duplicate items have been noted; 135 items have been added to the file of material submitted by grantees; 429 prints and engravings have been filed; and 5,549 cards have been added to the catalogue, of which 3,226 were L.C. cards and 2,323 were typewritten.

In addition, preliminary surveys have been made of the new manuscript collections, and considerable work has been done on the carding and brief calendaring of the Peter Lesley Papers. A bibliography of our manuscript Jeffersoniana, comprising 195 items, has been compiled and mimeographed. More than 1,300 titles of pre-1800 Americana have been checked with Sabin and Evans. Great progress has been made in the listing and arranging of duplicates, that have accumulated over a long period, which will enable us to make better disposition of them after the war.

Early in the year the 8,000 odd volumes which were left in the old library were moved to a room in the Drexel Building adjoining the Library's quarters on the third floor.[1] There remain now in the Society's hall only those few books which are shelved in the Reception Room, numbering about 600.

War Precautionary Measures.

As a precaution against possible bombing certain of the Library's most valued holdings, including the Franklin Papers, were removed to places of greater safety for the duration. Additional fire extinguishers and the usual buckets of sand were provided in the Library itself; the wooden shelves in the two vaults were replaced with steel shelving.

Restoration of Manuscripts and Rare Books.

Manuscript restoration was confined to work on the Jefferson Papers, Peter Lesley Papers, Thomas and Richard Penn Correspondence, and a few minor items. When the Jefferson Papers were filmed, the unbound items, 45 in number, were restored. In most instances this required little more than pressing, and a few minor repairs to the edges. Sixteen letter books of the Lesley

[1] See Report of the Committee on Hall, p. 60.

Papers, containing 100 to 300 letters each, were taken apart, and the individual items are now in process of being repaired. Seventy-four of the letters in the Penn Correspondence were repaired.

An appropriation of $500 was made for the repair of certain old leather books. Mrs. Helen A. Price has been employed to do this work in the Library's quarters rather than send the volumes to a commercial binder.

Archives of the Society.

During the year little new work was undertaken, the time being devoted almost exclusively to the detailed classification of material on hand. The present status of the work shows 3,500 pieces fully carded and classified, chiefly for the years 1768 to 1873, with a few scattered over the period up to 1898. For the same period there remain about 800 items which are partially carded, and 1,500 as yet uncarded.

More complete than any other single group of material is the file of documents and letters concerning the Library. Several hundred letters relating to donations to the Library are included within this group, besides statements as to the purchase of books, occasional mention of loans to various persons, letters and invoices from François André Michaux, David B. Warden, and George Ord, showing their activities in Paris on behalf of the Society, and similar letters and invoices from William Vaughan in London. These items are of great interest as being proof positive of the foreign connections of the Society, as are also the many letters of acknowledgment from foreign learned societies—the Royal Society of London, the Linnean Society of London, the Asiatic Society of Calcutta, the Société Impériale des Naturalistes de Moscou, the Königlich Preussische Akademie der Wissenschaften, the Société de Géographie, and others.

One fundamental change in policy was made during the year. In 1941 some time was devoted to research in other libraries in the Philadelphia area, especially the Academy of Natural Sciences and the Historical Society of Pennsylvania, in order to determine the extent of their holdings written by or to, or in any way concerning the American Philosophical Society. This policy was abandoned in favor of giving more concentrated effort toward the final classification of the Society's own holdings.

Photoduplication Service.

The Photoduplication Service has filled 30 outside orders, comprising 485 frames of microfilm, 355 enlargement prints, and 4 lantern slides. Receipts amounted to $77.23.

The reduction in the number of orders this year is owing in part to the large amount of filming done for the Society itself, and to the fact that we were without an operator from July through October.[1] As noted in last year's Report, the entire collection of Franklin Papers was filmed as a precautionary measure against bombing, before the original documents were placed in storage for the duration. This film, consisting of 64 100-ft. reels, comprises 46,157 frames, and represents an undertaking of which we are proud. Two positive copies were made, one of which has been deposited in a distant institution for safe-keeping, and the other is retained with the negative in the Library so that research work need not be interrupted. With the completion of the Franklin Collection in March, the Society's Minutes from 1758 to 1915, the manuscript Jeffersoniana, and a few minor items were filmed.

Inasmuch as other non-commercial microfilm laboratories in the area have been discontinued for the duration, the Library has determined to make every effort to continue its work, at least on a part-time basis, and to offer its services to other research institutions.

In-Use and Out-Use of the Library.

During 1942 there were 370 recorded visitors to the Library, all but 7 of whom came for research purposes, consulting 1,184 printed and 267 manuscript items. It is interesting to record here also that for the first time four readers used microfilms. Members of the Society borrowed 37 volumes; 67 volumes were lent to the staff, and 216 upon the interlibrary loan. This last figure includes 10 volumes which were lent to the Academy of Natural Sciences for one year, 3 volumes to the U. S. Signal Corps for the duration, and 5 volumes to the University of Pennsylvania for an exhibition. The loan made in 1941 to Brown University of 187 volumes dealing with Assyriology was renewed.

[1] Mr. Philip B. Wallace has been employed since November on a part-time basis.

Financial Statement.

Books and Binding and General Expenses.

Carried forward from 1941	$ 6,749.32
Appropriation for 1942	5,000.00
	$11,749.32
Expended during 1942	7,475.00 [1]
Balance 12/31/42	$ 4,274.32

Special Library Funds.

Balances 1/1/42	Income	Expended	Transferred to Principal	Balances 12/31/42
$16,694.50	$7,577.18	$2,025.58	$846.06	$21,400.04

Salaries.

For 1942	$ 9,337.04

[1] Includes the salary of the restorer of manuscripts.

4. REPORT OF THE COMMITTEE ON PUBLICATIONS

The Committee on Publications for the year 1942–43 consists of the following members: Jacob R. Schramm, *Chairman,* Franklin Edgerton, Luther P. Eisenhart, William E. Lingelbach, Forest R. Moulton, Arthur D. Nock, Ernest M. Patterson, Conyers Read, Adolph H. Schultz, T. Leslie Shear, George G. Simpson, Harold C. Urey, and Edwin G. Conklin, *President.*

During the year 1942 five meetings of the Committee were held, namely on February 7, April 4, May 16, October 10, and December 12.

At the special meeting of the Council on January 24 Dr. William E. Lingelbach was appointed Editor and Director of Publications to take office following the Annual Meeting. Following the Annual Meeting, Dr. Arthur W. Goodspeed, who had served for many years as a Secretary of the Society and recently as Managing Editor of Publications, his function being chiefly that of seeing the publications through the press, retired upon a pension. These further duties have been taken over by Dr. Lingelbach, and an office of publication has been set up on the ground floor of the Hall.

During the year the Board of Editors has had one representative from each division of the Society as formerly. However, next year the Committee as a whole will constitute the Board of Editors. The members will act as referees on monographs and manuscript volumes, or the Committee will choose appropriate referees when necessary. When such referees are not members of the Society, the Committee is authorized to pay an honorarium based upon the size of the manuscript and the difficulty of passing judgment upon it. In general the funds allocated to the Committee are expended on the publication of the PROCEEDINGS, TRANSACTIONS, and MEMOIRS. It is an established policy of the Society not to furnish subsidies to commercial or other publishers to aid in their publications.

The Society's own publications, while always occupying a major place in its activities, have varied considerably in importance from time to time. In recent years, with funds available for an adequate publication program, they have gradually assumed an increasingly significant role. This, in turn, places steadily increasing

responsibilities on the Editor and the Committee on Publications. Things printed under the aegis of a scientific and learned society are likely to be accepted *ipso facto* as more or less authoritative. They presumably represent the highest scholarly standards, both as to content and style. They become a part of the permanent record. More than any other phase of the Society's activities, the publications reflect the thought and work of the members, and the evidence of the Society's fidelity to its motto, "For Promoting Useful Knowledge." Moreover, they are and always will be the main permanent record. The obligation to establish and maintain the quality and standard of our publications is therefore obvious, and the editors solicit the continuance of the co-operation of members and authors. Without it the task is well-nigh impossible.

The problems of the Society's publications are unusually difficult. Manuscripts submitted for publication are almost as diverse in subject matter as are the special fields of interest of the Society's members. Hence the Committee on Publications and the Editor are confronted by much more complicated considerations than those confronting the editors of organizations devoted exclusively to one or, at most, two or three fields of science and learning. Furthermore, the problems have considerably increased, at least in quantity, by the Society's decision, two years ago, to undertake its own marketing, instead of farming it out, as is done with the printing. This means much more than is usually realized. It involves, in addition to the appraisal of manuscripts and the interesting though sometimes difficult relations with authors, the preparation of copy for the printer, the reading of proof, and seeing the work through the press; also, the varied problems of distribution and sale.

The significance of the latter, that is, the distribution and sale, cannot be stressed too much. Publications that fail to reach the reader are wasted. And since they often represent much expense in money and the time of scholars, the loss is tragic. To reduce this to a minimum is an accepted obligation of the Society.

Among the Society's four series of publications, the PROCEEDINGS offer a forum for the publication of papers of a broad philosophical outlook, as well as for highly specialized short studies such as are generally read at meetings. The TRANSACTIONS afford opportunity for similar works, which are, however, too long for publication in the PROCEEDINGS, and yet not long enough for the

MEMOIRS. The MEMOIRS, on the other hand, represent the Society's published scholarly output in single octavo volumes. It is with respect to the MEMOIRS that the Editor proposes a somewhat different policy from that pursued up to the present. In its essence, it involves the active development of a well-rounded series of volumes in special fields of scholarship. Such a program, while not interfering with the publication of individual meritorious works, would secure not only a desirable continuity to publications in the MEMOIRS class, but make possible a level of achievement comparable to those of the best scientific and learned societies abroad.

By way of illustration he suggested a study of the prospects for a series of volumes on Early Civilizations, brought to his attention by the submission for publication of several remarkable manuscripts, which would each benefit materially if put before the public in the proposed series. The first, to mention only one, is based on the unique records of the earliest literature of man, the hitherto undeciphered cuneiform literary tablets of the Sumerians. The plan was endorsed in principle by the Committee on Publications, and the Editor authorized to secure the co-operation of scholars among the Society's membership to study the possibilities and submit proposals for implementing the plan.

Even more in line with the interests of the Society is the proposal to develop a series on the history of American culture, associating with it the publication of especially rare and worthwhile Americana. One such—*Thomas Jefferson's Garden Book*—is now in press. It will be a fitting contribution by the American Philosophical Society toward the celebration in 1943 in honor of the great President of the United States who also served as President of the Society from 1797 to 1814. From the History of Science Society has come a well-developed plan for a series on the history of American science. Both of these would integrate closely with a phase of the Society's policy on the Library, discussed in the Report of the Library Committee.[1]

Meanwhile a beginning is being made on the series on Early Civilizations in an initial volume by Dr. S. N. Kramer, of the University Museum, University of Pennsylvania, on *Sumerian Mythology*.

The inauguration of series in several different fields of scholarship, of which those just mentioned are tentative illustrations,

[1] See page 64.

would not, as stated above, preclude in any way the publication of work of superior quality in other fields.

Added to these three types of publications is the YEAR BOOK, published regularly since 1938. It is an indispensable storehouse of information on the activities of the Society.

In July last, when the present Editor entered upon his duties, there was a large body of material in various stages of publication. Some appeared during the year, but by far the largest part was, because of the war and other conditions, delayed, so that two volumes of MEMOIRS, two parts of the TRANSACTIONS, and at least four numbers of the PROCEEDINGS will appear during the first half of 1943.

Fifty-nine manuscripts were accepted for publication during the year, as follows:

In the PROCEEDINGS	54 papers
TRANSACTIONS	1 monograph
MEMOIRS	4 monographs

Twenty-four manuscripts were considered and declined.

During the year the following contributions were published:

PUBLICATIONS OF THE AMERICAN PHILOSOPHICAL SOCIETY DURING THE YEAR 1942

TRANSACTIONS:

Vol. XXXII, Pt.2. January 1942.

O. Neugebauer. Egyptian Planetary Texts. 41 pp., 27 pls.

O. Neugebauer. On Some Astronomical Papyri and Related Problems of Ancient Geography. 12 pp.

Vol. XXXIII, Pt. 1. December 1942.

John Bartram. Diary of a Journey through the Carolinas, Georgia, and Florida. Annotated by Francis Harper. 120 pp., 23 pls., 37 figs., 8 maps.

PROCEEDINGS:

Vol. 85, No. 2. January 1942.

Charles P. Olivier. Long Enduring Meteor Trains. pp. 93–135. 3 tables.

H. R. Seiwell. An Analysis of Vertical Oscillations in the Southern North Atlantic. pp. 136–158. 13 tables, 11 figs.

Charles W. Gilmore. Paleocene Faunas of the Polecat Bench Formation, Park County, Wyoming. Part II, Lizards. pp. 159–167. 12 figs.

Carl Caskey Speidel. Studies of Living Nerves. VIII. Histories of Nerve Endings in Frog Tadpoles Subjected to Various Injurious Treatments. pp. 168–182. 1 pl., 11 figs.

George Harrison Shull. New Mutational Segregations from *Oenothera* mut. *erythrina* De Vries. pp. 183–214. 29 figs., 10 tables.

Frank G. Speck and Loren C. Eiseley. Montagnais-Naskapi Bands and Family Hunting Districts of the Central and Southeastern Labrador Peninsula. pp. 215–242. 2 figs., 2 charts.

Vol. 85, No. 3. February 1942.

Paul E. Shearin and T. Eugene Pardue. Electron-Electron Collisions in the Primary Energy Range from 1.3 to 2.6 Million Electron Volts. pp. 243–249. 4 tables.

F. Martin Brown. The Microscopy of Mammalian Hair for Anthropologists. pp. 250–274. 127 figs.

D. O. Hebb. The Effect of Early and Late Brain Injury upon Test Scores, and the Nature of Normal Adult Intelligence. pp. 275–292. 2 figs., 2 tables.

S. N. Kramer. A Preliminary Survey of the Oldest Literature in the World. pp. 293–323. 10 pls.

Vol. 85, No. 4. June 1942.

Earl H. Myers. A Quantitative Study of the Productivity of the Foraminifera in the Sea. pp. 325–342. 1 pl., 7 figs.

Leonard G. Rowntree. The Health of Registrants and the President's Plan of Rehabilitation. pp. 343–348. 4 tables. 2 charts.

Otto Struve. The Mystery of Cor Caroli. pp. 349–358. 1 table.

Ernest Edward Tyzzer. A Comparative Study of Grahamellae, Haemobartonellae and Eperythrozoa in Small Mammals. pp. 359–398. 24 figs., 3 tables.

Zdeněk Kopal. Theoretical Light Curves of Close Eclipsing Systems. pp. 399–431. 1 table.

Vol. 85, No. 5. September 1942.

James R. Angell. Education in a World at War. pp. 433–439.

George Gallup. How Important is Public Opinion in Time of War. pp. 440–444.

William Draper Lewis. An International Bill of Rights. pp. 445–447.

Howard Mumford Jones. Origins of the Colonial Idea in England. pp. 448–465.

Campbell Bonner. Two Studies in Syncretistic Amulets. pp. 466–471. 8 figs.

Arthur Darby Nock. Religious Attitudes of the Ancient Greeks. pp. 472–482.

Hellmut de Terra. The Megaliths of Bursahom, Kashmir, a New Prehistoric Civilization from India. pp. 483–504. 3 pls., 17 figs., 1 map.

Vol. 86, No. 1. September 1942.

Symposium on the Early History of Science and Learning in America.

Edwin G. Conklin. Introductory Remarks. pp. 1–2.

Frederick E. Brasch. James Logan, a Colonial Mathematical Scholar, and the First Copy of Newton's *Principia* to Arrive in the Colony. pp. 3–12.

Samuel Alfred Mitchell. Astronomy during the Early Years of the American Philosophical Society. pp. 13–21.

Horace C. Richards. Some Early American Physicists. pp. 22–28.

William J. Humphreys. A Review of Papers on Meteorology and Climatology Published by the American Philosophical Society Prior to the Twentieth Century. pp. 29–33.

Bailey Willis. American Geology, 1850–1900. pp. 34–44.

Dugald C. Jackson. Engineering in Our Early History. pp. 45–51.

M. L. Wilson. Survey of Scientific Agriculture. pp. 52–62.

M. L. Fernald. Some Early Botanists of the American Philosophical Society. pp. 63–71.

E. D. Merrill. A Generally Overlooked Rafinesque Paper. pp. 72–90.

Francis R. Packard, M.D. Medicine and the American Philosophical Society. pp. 91–102.

Detlev W. Bronk. Joseph Priestley and the Early History of the American Philosophical Society. pp. 103–107.

Francis W. Pennell. Benjamin Smith Barton as Naturalist. pp. 108–122.

Philip P. Calvert. Entomology, Scientific and Human Aspects. pp. 123–129.

George Gaylord Simpson. The Beginnings of Vertebrate Paleontology in North America. pp. 130–188. 23 figs.

Clark Wissler. The American Indian and the American Philosophical Society. pp. 189–204.

MEMOIRS: Vol. XVII.

James C. Malin. John Brown and the Legend of Fifty-Six. 794 pp. 8 documents, 2 maps.

YEAR BOOK for 1941.

The receipts from the sale of publications during 1942 amounted to $1,390.44. The cost of direct advertising was $154.66; this consisted of sending mimeographed announcements of certain publications to libraries, institutions, and individuals. In addition to this, copies of almost every publication issued by the Society during the year have been sent to appropriate journals for review.

COST [1] OF PUBLICATIONS DURING 1942

TRANSACTIONS:	
Vol. XXXII, Part 2. 53 pp., 27 pls.	$ 808.92
Vol. XXXIII, Part 1. 120 pp., 23 pls., 8 maps	1,416.97
PROCEEDINGS:	
Vol. 85, No. 2. 149 pp., 65 figs., 1 pl.	1,040.58
Vol. 85, No. 3. 80 pp., 129 figs., 10 pls.	757.48
Vol. 85, No. 4. 106 pp., 31 figs., 1 pl.	1,025.77
Vol. 85, No. 5. 71 pp., 25 figs., 1 map., 3 pls.	660.17
Vol. 86, No. 1. 204 pp., 23 figs.	1,426.69
MEMOIRS:	
Vol. XVII. 794 pp., 2 maps	3,056.20
YEAR BOOK FOR 1941	1,907.76

A sum of $500 was approved to cover the cost of the illustrations in John H. Gerould's paper entitled "Genetic and Seasonal Variations of Orange Wing-color in Colias Butterflies," which had been accepted for publication in the PROCEEDINGS.

Although out of accord with present policy, the Committee decided that it would be advisable, because of special circumstances, to publish William I. Hull's book on *Benjamin Furly and Quakerism in Rotterdam* in the Swarthmore Series rather than in the MEMOIRS and voted that a sum not to exceed $1200 be allowed for the manufacture of this volume.

[1] Includes all expenses connected with publications, viz. printing, engraving, wrapping, addressing, mailing, postage, etc., except that of reprints.

5. REPORT OF THE COMMITTEE ON RESEARCH

The Laws (Chap. V, Art. 4) specify that the Committee on Research shall consist of the President, *ex officio,* and not fewer than six other members, representative of the four Classes, who shall be nominated by the President and elected by the Council. In practice it has been found desirable to have more than six elected members in order to obtain wider representation of subjects. While regular election to the Committee is for a term of three years, several persons so elected have found it necessary to resign and others have been appointed to fill out their terms. There is no provision in the Laws against the reelection of a person to serve on this Committee. Several members of the Committee have served for two or more terms and their experience has been of great and increasing value. All serve without compensation, their only recompense being for actual expenses incurred in attending meetings, as in the case of all other committees.

The members of the Committee for 1941–1942, the subjects they represent and the dates of their last election are listed herewith:

Eisenhart, Luther P., *Chairman* (Mathematics), 1942.
Albright, William F. (Archaeology), 1942.
Bronk, Detlev W. (Biophysics and Physiology), 1942.
Cheyney, Edward P. (History), 1942.
Chinard, Gilbert (Languages and History), 1941.
Du Bois, Eugene F. (Medicine), 1942.
Fetter, Frank A. (Political Economy), 1942.
Keppel, Frederick P. (Education), 1942.
Morris, Roland S. (Jurisprudence), 1942.
Shapley, Harlow (Astronomy), 1942.
Sinnott, Edmund W. (Botany), 1940.
Swann, W. F. G. (Physics), 1942.
Taylor, Hugh S. (Chemistry), 1942.
Conklin, Edwin G., President, *ex officio* (Biology), 1942.

There are three research funds in the keeping of the Society, the Penrose Fund which is unrestricted, the Johnson Fund which is partially restricted in that it has been agreed that persons working in certain institutions may be regarded as occupying a preferred

position, and the Daland Fund which is restricted to research in clinical medicine and one institution has, for the time being, been given a preferred position. The Committee has been charged with the distribution of research grants from all three of these funds and the same forms of application and methods of procedure are used in all cases.

At the April meeting of the Committee a gift of $1,000 was reported from Dr. Henry Winsor of Haverford, Pennsylvania, for the purpose of having moving pictures made of the early development of the fish egg. Dr. Warren H. Lewis of the Wistar Institute of Anatomy and Biology was willing to supervise this project and. accordingly, the gift of Dr. Winsor was turned over to the Wistar Institute and a very successful record of the protoplasmic movements has been secured.

The Committee held five meetings during the year 1942, namely, on February 20, April 10, June 5, October 9 and December 11. Applications and supporting letters are manifolded and sent to the members of the Committee about ten days in advance of the meeting; in many cases members consult by correspondence or in person with applicants, or with persons conversant with the applicants or their projects.

Several years ago the Committee decided that apparatus and materials of lasting value that have been purchased from our research funds should be marked with metal tags reading: "Property of the American Philosophical Society, Philadelphia," and should be subject to recall when the project for which they were purchased had been fulfilled. The Committee has been receiving applications for apparatus and materials similar to that already on loan. In order to meet such applications, the Committee has voted to request the return of such items after the expiration of the period named in the application as the probable duration of the research, unless there are good reasons why this should not be done. A list of items now on loan follows:

Apparatus

Concave diffraction grating.
Equipment for aluminizing mirrors in optical train.
Regional spectrophotometer, direct vision hand spectroscope, thermostat for rapid reaction device.
High precision graduated circle with accompanying microscopes.
Geiger-Müller Counter, electrometer, ionization chamber.
Thermionic DC amplifier, galvanometer.

Permanent magnet for construction of beta-ray spectrograph.
10 milligrams radium-beryllium neutron source.
Warburg respirometer.
2 Densitometers.
Thermograph, hygrograph.
Taylor Instrument Co. dermatherm.
Dionic water tester.
Libby photronreflectometer.
Colorimeter.
High angle centrifuge.
2 Micro-manipulators.
Zeiss research microscope.
Spencer research microscope.
Spencer inclinocular research microscope, Spencer binocular dissecting microscope.
Photoelectric colorimeter.
Victoreen condenser-type r-meter with a 25-r chamber, 100-4 chamber tube and chamber.
Thermionic amplifier, galvanometer.
Amplifiers and recording system for encephalography.
Oscillograph.
Equipment for measuring alpha particles, and photograflue alpha particle recorder.
Spencer Stereoscopic Microscope, micro-projector, Nicholas illuminator.

Although in the past, grants have been made from the Penrose Fund in aid of publications, it has been decided that applications for such grants shall be referred to the Committee on Publications, but only in cases when the application is in keeping with the policy of this Committee.

The following general principles have been adopted by the Committee which are not departed from except under extraordinary circumstances:

1. Grants will be made only for the promotion of research and chiefly in the fields represented by the membership of the Society.

2. Grants will not be made to pay salaries of members of the staff of an educational or scientific institution. It is expected that such institutions will cooperate by furnishing at least general laboratory, library, and office facilities for those engaged in the investigation.

3. Grants will not be given for the support of professorships, fellowships, or scholarships, nor in general for work on doctoral theses. They will not be given for usual or permanent equipment of the institution involved. Special apparatus of permanent value purchased by means of a grant shall become the property of the Society, for such disposition as the Society may determine when the purpose for which it was purchased has been fulfilled.

4. Projects, methods of procedure, places where the work is to be done, and any cooperation of the institution where the research is to be conducted and of other institutions or agencies should be clearly stated.

5. Preference will be given to the support of investigations which are already well begun and in which definite results can be expected with the aid of the grant. Projects requiring long continued support cannot in general be assisted.

6. Any publication of work supported in whole or in part by a grant from this fund shall state in connection with the title that the work was supported by a grant from the particular fund of the American Philosophical Society from which the grant was made, and a copy of such publication shall be sent to the Society.

7. As a general policy the funds allocated to each project will be disbursed quarterly by the Society to those in charge, unless the nature of the work requires a different arrangement.

8. Reports of expenditures from grants are expected semiannually, and a report of progress shall be made by the grantee to the Committee on Research annually. A summary of the work shall be presented to the Society for publication in its Year Book when that part of the work for which the grant was made is completed.

9. No recipient of a grant shall thereby become an employee of the Society.

Because of the participation of many scientific men in research connected with the war effort, particularly in certain fields, the request for grants during the past year has not been as large as previously. The Committee has not taken the occasion of the reduction in the number of requests for grants to lower the standards it has set for making grants. Also in some instances where grants have been made it has developed that it is not possible to carry out the research in the time contemplated, either because a recipient had been called into work in connection with the war effort or it was impossible to obtain certain apparatus in connection with the project for which the grant was made.

At its meeting on October 9, the Committee in considering the reduction in the number of requests for grants came to the conclusion that after the war there would be an increased demand for grants above normal after the scholars of the country, particularly the younger ones, are once again able to proceed with their investigations in fundamental research. Accordingly, the Committee recommended that there should not be any reduction in the amount

assigned for 1943 for research, and that any unexpended balances in each of the three funds this year and in 1943 should be carried over to be disposed of by the Committee, if and when there is an increase in appropriate requests after the war.

THE PENROSE FUND

The budget for 1942 assigned $100,000 from the income of the Penrose Fund for the support of research. However, it was recommended and approved by the Society that $25,000 be appropriated from the $100,000 for a series of short-wave broadcasts from the Hall of the Society over Station WRUL of the World Wide Broadcasting Foundation.[1] To the sum of $75,000 for research was added a balance of $24,740.47 carried over from 1941 and refunds and cancellations amounting to $2,347.82, so that a total of $102,087.82 was available for grants during the year. The following 72 grants, plus 4 additional grants authorized in 1941 to be drawn from the 1942 budget and one supplementary grant of $43.00, were awarded, totalling, $62,020.19, and leaving a balance of $40,068.10 to be carried over to the 1943 budget. In addition to these sums granted from the 1942 budget, grants amounting to $3,000 have been approved to be drawn from the 1943 budget.

Grant No. 604. O. C. Glaser, Amherst College, for the purchase of a densitometer to be used for the quantitative spectrographic analysis of salt metabolism in developing Fundulus eggs and senescent Drosophila .... $ 691.98

Grant No. 605. Harry Gregory Albaum, Brooklyn College, for equipment for the study of the relation between growth and metabolism in higher plants. (Second grant.) 300

Grant No. 606. Henry N. Andrews, Jr., Washington University, for an assistant, equipment and transportation in connection with the study of the fossil flora of the carboniferous rocks of southern Illinois. (Third grant.) 200

Grant No. 607. G. P. Cuttino, University of Iowa, for assistants and traveling expenses for the preparation for publication of the calendar of documents in possession of the English government relating to France and Gascony, temp. John-Edward II. 250

Grant No. 608. Allan Nevins, Columbia University, for travel, microfilming and stenographic assistance for the preparation of a comprehensive history of the United States, political, economic, and social, from 1849 to 1861, inclusive 1,500

Grant No. 609. Bernard O. Dodge, New York Botanical Garden, for an assistant in the study of the inheritance, first and second genera-

[1] See pp. 35, 56.

tions, of the factors governing heterocaryotic vigor in certain new races of the pink bread mold Neurospora 1,200

Grant No. 610. Stuart McGregor Pady, Ottawa University, Kansas, for field work, travel, infection work and photographic materials for investigations on Melampsorella, the Witches' Broom disease of spruce and fir. (Second grant.) 750

Grant No. 611. John Ellsworth Merrill, Hunter College, for computing assistants in the preparation of tables for the calculation of the orbits of eclipsing variables when the star-disks are totally or partially darkened at the limb. (Second grant.) 150

Grant No. 612. M. Bruce Fisher, Fresno State College, for wages of subjects and labor in connection with the study of the influence of the surrounding field on foveal function. (Third grant.) 100

Grant No. 613. Arthur G. Steinberg, McGill University, for the purchase of a dissecting microscope for the study of the mode of action of mutants affecting size, shape and pigmentation of the eye of Drosophila melanogaster and to investigate the nature of the dependence of the brain upon the eye for its normal development 600

Grant No. 614. Fritz G. A. Kraemer, Guest Worker, Library of Congress, for the preparation of a reference book on *The Parliaments of Continental Europe from 1815 to 1914*. (Second grant.) 1,000

Grant No. 615. Nicolas A. Michels, Jefferson Medical College, for an artist and materials for the study of anatomical variations in the blood supply of the liver and gallbladder as ascertained from dissections of one hundred cadavers 200

Grant No. 616. Theodore C. Schneirla, New York University, for a student assistant and films for correlated studies on learning and social organization in ants 475

Grant No. 617. Chester McArthur Destler, Elmira College, for travel and photography in connection with the preparation of a biography of Henry Demarest Lloyd 450

Grant No. 618. Otto F. Meyerhof, University of Pennsylvania, for an assistant, apparatus and chemicals for the study of intermediate reactions of the anaerobic carbohydrate breakdown 1,500

Grant No. 619. Elizabeth Rona, Trinity College, Washington, D. C., for equipment and apparatus for the study of the radioactivity of sea water 1,000

Grant No. 620. Edward C. Armstrong, Princeton University, for a research associate in connection with the study of Medieval French and Spanish poems about Alexander the Great 2,000

Grant No. 621. Albert F. Blakeslee, Carnegie Institution of Washington, Department of Genetics, for assistants in the determination of the factors involved in chemical regulation of embryo development in plants with possibility of their ultimate control. (Second grant.) 700

Grant No. 622. Oren F. Evans, University of Oklahoma, for field expenses, equipment and assistants for the study of the origin of spits, bars and related structures. (Second grant.) 100

Grant No. 623. Wendell R. Mullison, Purdue University, for an assistant, supplies and equipment for the study of the interdependence of calcium and nitrogen as they affect plant metabolism 350

Grant No. 624. S. O. Mast, Johns Hopkins University, for an assistant in the study of physical and chemical properties of growth substance (vitamin) produced by the flagellate Chilomonas paramecium and its effect on growth in other organisms; methods for "mass production" of Chilomonas paramecium, for the purpose of producing starch, fat and vitamins. (Second grant.) 500

Grant No. 625. Dirk Brouwer, Yale University, for computing assistants for the determination by photography of the positions and proper motions of approximately 106,000 stars between declinations + 20° and — 30° 1,000

Grant No. 626. Albert P. Kline, Washington College, Chestertown, Md., for chemicals and apparatus in connection with the extension and examination of qualitative tests for various amino acids 200

Grant No. 627. Albert Tyler, California Institute of Technology, for a technical assistant in the study of methods of production and properties of univalent antibodies. (Third grant.) 600

Grant No. 628. Albert F. Blakeslee, Carnegie Institution of Washington, Department of Genetics, for assistants in the determination of the factors involved in chemical regulation of embryo development in plants with possibility of their ultimate control 1,800

Grant No. 629. John P. Gillin, Duke University, for travel while making a survey of the mutual modifications of Indian and European cultures in the tropics, as illustrated by a study of the situation in Guatemala 700

Grant No. 630. James A. Geary, Catholic University of America, for travel, interpreter, etc., in connection with the transcription and translation of a Fox Indian text of a mythologic nature. (Third grant.) 500

Grant No. 631. George S. Avery, Jr., Connecticut College, for a research assistant and materials for the study of plant auxins in the endocrine glands and certain other organs of higher animals 1,500

Grant No. 632. Boris Ephrussi, Johns Hopkins University, for an assistant and equipment for the study of the mechanism of action of individual genes in controlling chains of developmental reactions. (Second grant.) 1,500

Grant No. 633. Thomas Corwin Mendenhall, II, Yale University, for an assistant in translating and editing the dispatches of J. F. Schlezer, Brandenburg Envoy to England, 1655–1660 350

Grant No. 634. Arthème A. Dutilly, Catholic University of America, for field work and materials for the completion of collections of North American Arctic flora. (Third grant.) 600

Grant No. 635. Edward Girden, Brooklyn College, for the construction of amplifiers and recording system for encephalography to be used for the correlation of the mechanisms mediating the dissociation produced by erythroidine and curare in animals with the effect of hypnotic suggestion upon pupillary conditioned reflexes and brain waves in human subjects. (Third grant.) 1,000

Grant No. 636. F. B. Isely, Trinity University, Texas, for technical assistance, field work and laboratory experiments in connection with the study of ecological factors affecting Texas orthoptera. (Second grant.) 600

Grant No. 637. Frank R. Kille, Swarthmore College, for assistance and illustrations in connection with the study of the differentiation of the cells of the mesentery during regeneration of the digestive system in the sea-cucumber, Stichopus californicus. (Second grant.) 200

Grant No. 638. LaDema Mary Langdon, Goucher College, for a technical assistant and an artist in connection with the comprehensive, comparative survey of the flower, inflorescence, and embryological features of species of all existing genera of the Fagaceae. (Second grant.) 400

Grant No. 639. James Hain Leathem, Rutgers University, for food for rat colony, etc., in connection with studies concerned with the influence of gonadotropic and androgenic hormones on the reproductive organs of normal and hypophysectomized rats 400

Grant No. 640. Elmer D. Merrill, Harvard University, for an assistant in the intensive study of the large accumulated botanical collections from China, particularly from Kwangtung, Kwangsi, Keeichow and Hainan. (Second grant.) 500

Grant No. 641. Frederic Chapin Lane, Johns Hopkins University, for an assistant in the preparation of a volume on the Venetian nobility in the fifteenth and sixteenth centuries 600

Grant No. 642. Clarence William Clancy, University of Oregon, for the purchase of a photoelectric colorimeter for the analysis of the relation of various mutant genes to specific steps in the reaction chains involved in the development of eye color pigment in Drosophila melanogaster 150

Grant No. 643. R. R. Huestis, University of Oregon, for an assistant in connection with the test of the linkage relations of silver pelage and flexed tail in Peromyscus maniculatus 400

Grant No. 644. Harrison L. Chance, University of Oklahoma, for travel and maintenance while investigating the staining of internal structures of bacteria 250

Grant No. 645. Margaret H. Fulford, University of Cincinnati, for an assistant in making investigations in morphogenesis and regeneration in certain members of the family Lejeuneaceae of the Hepaticae 1,200

Grant No. 646. Roderick Menzies, Sarah Lawrence College, for apparatus and wages of subjects for the determination of individual differences in (1) thresholds of affectivity in human subjects; (2) the rate of conditioning of affective responses; and (3) the rate of extinction of the conditioned responses 400

Grant No. 647. Jerzy Neyman, University of California, for a part-time assistant in the production of tables of probabilities of errors in testing linear hypotheses 480

Grant No. 648. Walter W. Taylor, Harvard University, and William C. Boyd, Boston University, for technical assistance to establish the blood groups of the pre-historic Indians of Coahuila by serological tests of their mummified remains 200

Grant No. 649. Norman H. Giles, Jr., and Richard F. Humphreys, Yale University, for apparatus to study the comparative effects

of x-rays and neutrons in inducing chromosomal rearrangements and mutations, primarily in Tradescantia; measurement of neutron dosages and intensity of neutron radiation 440

Grant No. 650. Edward H. O'Neill, University of Pennsylvania, for field work and travel while preparing a bibliography of American literature 1,500

Grant No. 651. Kenneth C. Fisher, University of Toronto, for technical assistance and equipment for the study of the quantitative effects of narcotics and allied inhibitors on isolated enzyme systems . 425

Grant No. 652. Buffalo Society of Natural Sciences, for a research assistant for the study of the collections of Syro-Hittite material—stamps and cylinder seals in the Buffalo Museum of Science 750

Grant No. 653. Herbert Shapiro, Hahnemann Medical College, for the purchase of an oscillograph with which to study nerve and brain function at reduced oxygen pressures. (Second grant.) .. 700

Grant No. 654. Aron Gurwitsch, Johns Hopkins University, for the study of William James' theory of the "transitive parts" of the stream of thought; comparative study of William James' concept of the "object of thought" .... 1,800 [1]

Grant No. 655. Samuel Alfred Mitchell, Leander McCormick Observatory, University of Virginia, for technical assistant for a study of the spectrum of the chromosphere from photographs obtained at eclipses of the sun 1,500

Grant No. 656. Charles A. Berger, Biological Laboratory, Fordham University, for a part time research assistant in the comparative cytological study of the prophases of meiosis and the prophases of the tetraploid and octoploid somatic cells found in the meristematic regions of the root tips of spinach 500

Grant No. 657. American Law Institute, Philadelphia, for reporters, assistants, travel, etc. in connection with the study of whether the concepts of individual rights in the United States and the British Commonwealth of Nations, and among those of liberal thought in the Latin American countries, the countries of Western Europe, Russia, China, and India, are sufficiently similar to make possible the careful expression of these rights in an International Bill of Rights:—if so to prepare a model draft 5,000

Grant No. 658. Alexander Sandow, Washington Square College, New York University, for assistance and equipment for the study of the effect of pH, tissue poisons, and anisotonicity on the mechanical events of the latent, contraction, and relaxation periods of skeletal muscle contraction 1,250

Grant No. 659. Hellmut de Terra, Quakertown, Pa., for travel and subsidence in connection with the writing of a book entitled *The Geologic Age of Man* 1,200

[1] $600 of this grant was received from an outside source to be disbursed by this Society.

Grant No. 660. H. J. Muller, Amherst College, for a research assistant for the investigation of the mechanism of chromosome breakage by irradiation 990

Grant No. 661. Charles W. Metz, University of Pennsylvania, for research assistant for the study of analysis of evolutionary changes occurring within the chromosomes in Sciara, through studies on the giant salivary gland chromosomes 1,500

Grant No. 662. Reginald Ruggles Gates, Marine Biological Laboratory, for typing, preparation of illustrations in connection with the preparation of a large work on Human Genetics 390

Grant No. 663. T. M. N. Lewis, University of Tennessee, for an assistant for the archaeological investigations in areas of Tennessee which are being inundated by the TVA dams. (Second grant.) . 2,000

Grant No. 664. Fay-Cooper Cole, University of Chicago, for an assistant for the further translating of old documents and completion of the calendaring of material relating to the contact period of Indian and White in the Middle West. (Second grant.) 1,000

Grant No. 665. V. F. Hess and F. A. Benedetto, Fordham University, to repair 55 Geiger-Mueller tubes of a Dual Cosmic Ray Telescope. (Second grant.) 100

Grant No. 666. Floyd H. Allport, Syracuse University, for the employment of subjects, materials and statistical help for an experimentally controlled study of the motivational strength of verbal materials with special reference to alternative methods of verbally presenting the same content 200

Grant No. 667. F. Ronald Hayes, Dalhousie University, for two assistants for a study of the inorganic metabolism of developing salmon eggs. (Second grant.) 500

Grant No. 668. Henri Laugier, University of Montreal, for two assistants, animals, chemicals, etc., in connection with the research on the healing of war wounds and the repairing of tissues 1,800

Grant No. 669. Edwin Morris Betts, University of Virginia, expenses in editing the *Jefferson Garden Book* 285.21

Grant No. 670. Franz Boas, Columbia University, for assistance in the completion of a study of the interrelation between physical and mental development .... 500[1]

Grant No. 671. Wolf Leslau, Flushing, N. Y., maintenance and travel in connection with the preparation of a *Gouragué* (South-Abyssinian) *Dictionary* 1,200

Grant No. 672. Charles de Tolnay, Institute for Advanced Study, for photographs and travel in connection with the preparation of a *Handbook of Old Master Drawings* 250

Grant No. 673. Carl Caskey Speidel, University of Virginia, for materials and apparatus to study and record by cinephotomicrography the histological changes exhibited by cells of living frog tad-

[1] Grant approved for the completion of the work of the late Dr. Boas.

poles, as the animals are subjected to various experimental procedures 200

Grant No. 674. John E. Weaver, University of Nebraska, assistance, field work, travel for the completion of the nature and rate of recovery of the midwestern grasslands from the great drought (1934–1940). (Fifth grant.) 600

Grant No. 675. S. E. Asch and H. A. Witkin, Brooklyn College, for assistance and apparatus in connection with the investigation of the role of visual and postural factors in the determination of the perceived vertical and horizontal 350

The distribution of these grants to various subjects is shown in the following table:

		Grants	Amount
Class I.	Mathematics	1	$ 480
	Astronomy	3	2,650
	Physics	2	143
	Chemistry and Geochemistry	2	2,500
Class II.	Geology	1	100
	Paleontology	1	200
	Zoology	6	3,991.98
	Genetics and Cytology	10	7,170
	Ecology	2	1,200
	Botany	10	7,385.21
	Bacteriology	1	250
	Anthropology	4	2,900
	Psychology	6	2,525
	Anatomy	2	400
	Physiology	4	2,775
	Biochemistry	1	200
	Medicine	1	1,800
Class III.	History, American and Modern	3	2,300
	Government	2	6,000
Class IV.	Philosophy	1	1,800 [1]
	History, Ancient, Medieval and Cultural	2	850
	Archaeology	2	2,750
	Ethnology	1	700
	Philology and Languages	2	1,700
	Literature	2	3,500
	Art	1	250
Miscellaneous.	Dictionary of American Biography	1	2,500
	Committee on Urban Research	1	1,000
	Dana System of Mineralogy	1	2,000
	Total	76	$62,020.19

[1] $600 of this grant was received from an outside source.

A summary of the research grants from the Penrose Fund made since the beginning of the Society's research program in mid-summer of 1933 is shown in the following table:

SUMMARY OF GRANTS AWARDED FROM THE PENROSE FUND
From July 31, 1933 to December 31, 1942

		Grants	Amount	Refunds	Total
Class I.	Mathematics	6	$ 5,280.00		$ 5,280.00
	Astronomy and Astrophysics	33	32,950.00		32,950.00
	Meteorology	4	2,232.00	$ 21.75	2,210.25
	Physics	73	75,312.53	2,864.66	72,447.87
	Geophysics	3	4,200.00		4,200.00
	Chemistry and Geochemistry	46	41,300.00	2,264.77	39,036.77
	Engineering	1	75.00		75.00
	Total	166	161,349.53	5,151.18	156,199.89
Class II.	Geology	9	4,405.00		4,405.00
	Paleontology	16	10,025.00		10,025.00
	Geography and Physiography	3	1,200.00		1,200.00
	Zoology	68	39,732.73	203.73	39,529.00
	Genetics and Cytology	52	44,165.00	423.60	43,741.40
	Ecology, Limnology, and Oceanography	16	8,262.50		8,262.50
	Botany	48	34,333.21	1,227.00	33,106.21
	Bacteriology	6	3,300.00		3,300.00
	Anthropology	14	20,300.00	2,146.14	18,153.86
	Psychology	19	9,415.00	555.00	8,860.00
	Anatomy	15	9,825.00	342.75	9,482.25
	Physiology	61	51,260.00		51,260.00
	Biochemistry	3	1,100.00		1,100.00
	Pathology, Medicine, and Immunology	14	10,400.00	.07	10,393.00
	Total	344	247,724.44	4,898.29	242,818.22
Class III.	History, American and Modern	25	15,350.00		15,350.00
	Political Science and Government	8	15,360.00	78.31	15,281.69
	Sociology	3	2,000.00		2,000.00
	Total	36	32,710.00	78.31	32,631.69

SUMMARY OF GRANTS AWARDED FROM THE PENROSE FUND—*Continued*

		Grants	Amount	Refunds	Total
Class IV.	Philosophy	3	2,600.00	600.00	2,000.00
	History, Ancient, Medieval, Cultural	15	7,675.00	350.00	7,325.00
	Archaeology	35	43,025.00	5,944.53	38,080.47
	Ethnology	14	10,850.00	500.00	10,350.00
	Philology and Languages	25	21,825.00	42.27	21,783.73
	Literature	15	20,150.00	750.00	19,400.00
	Drama	2	1,000.00		1,000.00
	Music	4	3,400.00		3,400.00
	Art	6	4,450.00		4,450.00
	Architecture	3	2,700.00		2,700.00
	Total	122	117,675.00	8,186.80	110,489.20
MISCELLANEOUS		15	33,550.00	9.45	33,540.55
TOTAL		683	593,008.97	18,324.03	575,679.55

Total appropriations July 1933 to December 31, 1942	$615,000.00	
Refunds and cancelled grants	18,324.03	
		$633,324.03
Total grants July 1933 to December 31, 1942	593,007.97	
Expenses 1933–36*	247.96	
		593,255.93
Balance on hand December 31. 1942		40,068.10

* After this date a separate fund was established for research expense.

THE JOHNSON FUND

The budget for the year 1942 assigned the sum of $19,000 for research from the income of the Eldridge Reeves Johnson Fund. To this was added $6,480, unexpended balance carried over from 1941 and refunds amounting to $860, so that a total of $26,340.76 was available for grants during the year. The following twelve grants amounting to $12,800 were approved during the year leaving a balance of $13,540.76. In addition to the sums granted from the 1942 budget a grant of $3,000 has been approved to be drawn from the 1943 budget.

Grant No. 41. Teng-Chien Yen, California Academy of Sciences, for travel and maintenance for the continuation of a study in different institutions in America where collections of Chinese mollusks are preserved; review and summary of the Tertiary and Quaternary non-marine mollusks of China; list of known Chinese species of recent mollusks $1,200

Grant No. 42. Samuel Noah Kramer, University Museum, University of Pennsylvania, copying of Sumerian literary tablets and fragments and reconstructing and translating of the Sumerian literary compositions .... 3,000[1]

Grant No. 43. Robert G. Chaffee, Academy of Natural Sciences, for travel and equipment in connection with the continued investigation of the fossil fauna and stratigraphy of the White River Oligocene of Wyoming, in the Lance Creek Basin to the west of the area studied last year .... 500[2]

Grant No. 44. Horace G. Richards, Academy of Natural Sciences, for field work in connection with the investigations on Coastal Plain Paleontology 450

Grant No. 45. Samuel George Gordon, Academy of Natural Sciences, for transportation and travel, to study the origin of minerals formed under conditions of extreme aridity .... 350[3]

Grant No. 46. Richard A. McLean and G. Ayers Voentry, Academy of Natural Sciences, for travel, to study the fishes and invertebrates of the southern Piedmont and coastal plain 250

Grant No. 47. H. Radclyffe Roberts, Academy of Natural Sciences, for travel and field expenses, to determine the phylogeny of a virtually unknown grasshopper, which occurs in the spring in southeastern California 250

Grant No. 48. Detlev W. Bronk, Johnson Research Foundation, University of Pennsylvania, two assistants and equipment, for a study of the oxygen supply and oxygen utilization of the brain and of the peripheral nervous system with special reference to the oxygen requirements for maintaining the resting and the active structure of nerve cells 3,100

Grant No. 49. Walter Karl Wilbur, University Museum, University of Pennsylvania, for travel, drawing, typing, etc., for a comparative study on significant pre-Cortesian Codices from Mexico 1,000

Grant No. 50. Academy of Natural Sciences, Philadelphia. Publication of the second and final volume of a monographic study entitled "Land Mollusca of North America (North of Mexico)" by Henry A. Pilsbry 1,500

Grant No. 51. Academy of Natural Sciences, Philadelphia. Publication of "The Chorisoneurinae and Ectobiinae of Australia (Orthoptera, Blattidae)" by Morgan Hebard 600

Grant No. 52. Academy of Natural Sciences, Philadelphia. Publication of a monographic study "The Scrophulariaceae of the Western Himalayas" by Francis W. Pennell 600

[1] $6,000 approved for this project—$3,000 to be drawn from the budgets of each of the years 1942 and 1943.

[2] Grant relinquished.

[3] *Ibid.*

THE DALAND FUND

The appropriation from the income of the Judson Daland Foundation for Research in Clinical Medicine at the beginning of the year 1942 was $8,000 to which was added $920, unexpended balance carried over from 1941, making a total of $8,920 available to the Committee on Research during the year 1942. From this sum the following grant, amounting to $6,000, was made leaving a balance of $2,920.

Grant No. 7. Philadelphia Institute for Medical Research for continued support of the work of the Institute during 1942 ....$6,000

REPORTS FROM RECIPIENTS OF GRANTS[1]

(Arranged Alphabetically under the Classification of Subjects Represented in the Membership of the Society)

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

MATHEMATICS

Richard Courant, New York University Graduate School

Grant No. 486 (1940), $1,200. Completion of a manuscript on Dirichlet's Principle and its applications to conformal mapping and minimal surface theory.

Since the middle of the 19th century "Dirichlet's Principle" has been a mathematical topic of paramount importance. Recently, the work of Jesse Douglas on minimal surfaces has led to renewed interest in the subject. The grantee and his collaborators, in particular Max Shiffman, have investigated the theory of minimal surfaces from the point of view of Dirichlet's principle. They have given a complete and relatively simple solution of Douglas' general problem: to prove the existence of minimal surfaces of given topological structure and with prescribed boundary curves. The theory has been further extended to problems with free boundaries. It has also been shown that the theory of unstable minimal surfaces is accessible to the methods of Dirichlet's Principle. Furthermore, new general theorems on the conformal mapping of multiple connected domains have been obtained.

Since the grant was made results have been published in various periodicals, preparatory to a unified presentation in the form of a monograph. The manuscript of this monograph is now essentially completed, and it is hoped that publication before long will be possible. The first two chapters of the book are devoted to the boundary value problem for harmonic functions and to the conformal mapping of Riemann domains on normal domains (slit-domains). In Chapters III and IV Plateau's and Douglas' problems are solved. In Chapter V new theorems on conformal

[1] All grants are from the Penrose Fund unless otherwise specified.

mapping are derived. In the last chapter the theory of minimal surfaces is extended to problems with free boundaries and to unstable minimal surfaces.

HILDA GEIRINGER, Bryn Mawr College

Grant No. 543 (1941), \$400. Study of some of the procedures known under the collective name, "Analysis of Variance" on more general assumptions than those usually made.

Two papers representing a research under the grant in aid of the American Philosophical Society appeared this year.

The second of these papers carries out the main idea of the whole research which is to investigate which of the results of the so-called Analysis of Variance Theory still holds if the assumption of normality of the populations (which is usually made) is dropped. One of the problems which has been particularly studied is that of *dependent* populations. In connection with this question the problem of arbitrarily linked events (studied by the author in previous papers) has been resumed in the first paper. One of the more important results of this paper is to establish the conditions which the moments of a discontinuous distribution with steps at given points have to satisfy.

GEIRINGER, HILDA, 1942. A Note on the Probability of Arbitrary Events. Annals of Math. Statistics 13: 238–245.

—— 1942. Observations on Analysis of Variance Theory. Annals of Math. Statistics 13: 350–369.

ASTRONOMY

DIRK BROUWER, Yale University Observatory

Grant No. 625 (1942), \$1,000. Determination by photography of the positions and proper motions of approximately 106,000 stars between declinations $+20°$ and $-30°$.

The determination of new positions by means of photography for the stars in the Astronomische Gesellschaft catalogues with declinations from $-2°$ to $-10°$ is part of the general plan of the Yale Observatory to re-observe all Astronomische Gesellschaft stars from $+30°$ to $-30°$. The program was initiated by Dr. Frank Schlesinger, now Director Emeritus of the Yale Observatory. All the necessary photographs for this work were taken at the Yale

Southern Station in Johannesburg, South Africa, and then measured in New Haven, before he retired in 1941.

Each plate extends over 10°.9 in right ascension; therefore the sixty-six plates of the zone cover the entire area twice. The plates overlap in right ascension so that the center of one plate is at the edge of the preceding one. Thus each star appears on two plates and the final catalogue position is the mean of these two positions.

To find right ascensions and declinations from the measurements of the star images on the plates, it is necessary to have accurate positions of a small number of stars for approximately the epoch of the plates. These stars are referred to as comparison stars. In this zone they average forty-six on a plate. The Yale Observatory is indebted to Dr. Jackson and the Royal Observatory of the Cape of Good Hope for the excellent positions of this set of comparison stars. The mean epoch of observation differs by less than one year from the mean epoch of the Yale plates, which is 1933.5.

The Astronomische Gesellschaft catalogues in these zones are the Strassburg catalogue from − 2° to − 6° and the Wien-Ottakring from − 6° to − 10°. The Thomas J. Watson Astronomical Computing Bureau of Columbia University carried out the extensive computations required to bring these Astronomische Gesellschaft positions up to the equinox of 1950, and to find the rectangular coordinates on the plates for all of the stars, which number more than 16,000.

For the comparison stars the rectangular coordinates X and Y on each plate were computed from the recent Cape positions. Since the Yale plates were taken with the identical camera and under similar conditions as were those in the zones to the south, the measures were corrected for the same optical distortion and for the same difference of scale due to spectral type. The results of the least-squares solutions described in the following paragraph show the values used are satisfactory.

Representing by ΔX and ΔY the difference between the Yale measurements and the computed rectangular coordinates of the star, equations are formed:

$$\begin{aligned} &+ c + aX + bY + fX^2 + gXY = \Delta X \quad \text{in right ascension} \\ &+ k + lX + mY + rY^2 + sXY = \Delta Y \quad \text{in declination} \end{aligned} \qquad (1)$$

The coefficients c, a, etc., are then determined by means of 132 least-squares solutions, two for each plate. Each plate solution

furnishes a value for the probable error of one observation. These average $\pm 0''.214$ in right ascension and $\pm 0''.202$ in declination. They include the inaccuracies of both the photographic measures and the meridian observations. Dr. Jackson has given the probable error of the meridian places as $\pm 0''.173$ in right ascension and $\pm 0''.151$ in declination. Thus the probable error of a final catalogue position, depending as it does on two plates is $\pm 0''.089$ in right ascension and $\pm 0''.095$ in declination. Further determinations of the probable error have yet to be made by comparing the position on the preceding plate with that on the following plate for each one of the more than 16,000 stars. In any case it appears that the value of the probable error for a catalogue position will not exceed $\pm 0''.10$ in either coordinate. This is slightly less than the values $\pm 0''.120$ in right ascension and $\pm 0''.105$ in declination obtained for the zone $-10°$ to $-20°$ [1] and practically the same as the value $\pm 0''.105$ in either coordinate found for the zone from $-20°$ to $-30°$, to be published in the near future.

The collection of the residuals to determine the presence of terms of the third order or of the second order not included in the equations (1) give the following terms, X and Y being expressed in millimeters:

$$-52''X^3.10^{-9}+58''XY^2.10^{-9}+66''X.10^{-5}-28''Y^3.10^{-9}$$
$$+20''X^2Y.10^{-9}+6''Y.10^{-5} \quad \text{in right ascension}$$
$$+13''X^3.10^{-9}+39''XY^2.10^{-9}-49''X.10^{-5}+50''Y^3.10^{-9}$$
$$-51''X^2Y.10^{-9}+3''Y.10^{-5}+17''X^2.10^{-7}-''.01 \quad \text{in declination}$$

The presence of the linear terms is due to the fact that each higher order term requires a modification of some lower order term in the least-squares solutions. These third order terms are similar in form and in size to those found in other zones. Corrections due to these terms will be applied to the final positions of all stars.

The residuals of the least-squares solutions give the photographic positions of the comparison stars at once. The derivation of the photographic positions for all the stars in the zone requires that the plate constants of the least-squares solutions be applied individually to the measures of each star. This is the most laborious operation in this part of the work. Final positions have not yet been obtained but satisfactory progress is being made, and it is hoped there will be no delay in completing the catalogue.

[1] Yale Observatory Transactions, 11: 5–13 (1939).

This work was done under the immediate supervision of Dr. Ida Barney.

GERHARD HERZBERG, University of Saskatchewan

Grant No. 139 (1937), $1,300. Investigation of the solar spectrum in the photographic infra-red; various investigations of molecular spectra.

The work on the CH^+ molecule and its identification in interstellar space discussed in the preceding report was concluded.

The investigation of the photographic infra-red spectrum of fluoroform (CHF_3) mentioned in the preceding report has been continued and a considerable number of absorption bands have been found. In order to make further progress and particularly in order to determine the internuclear distances in the molecule by means of a fine structure analysis, it will be necessary to improve the light gathering power of the apparatus used at the present time.

Following up a suggestion by the writer concerning the so-called λ4050 group observed in the spectra of comets, the spectra of discharges through rapidly streaming methane were investigated and the λ4050 group was indeed reproduced in the laboratory. It is in all probability due to the CH_2 molecule. Fairly extensive attempts to obtain this spectrum in absorption have failed thus far. However, it is hoped that it will be possible in the near future to obtain the emission spectrum with sufficient freedom from overlapping that an analysis will be possible and that the structure of the free CH_2 radical can be established.

HERZBERG, G., 1938–1942. Reports of Progress. Yr. Bk. Amer. Philos. Soc. for 1937: 232; for 1938: 178; for 1939: 234; for 1940: 189; for 1941: 94.

—— 1942 (with DOUGLAS, A. E.). Band Spectrum and Structure of the CH^+ Molecule; Identification of Three Interstellar Lines. Can. Jour. of Res. A 20: 71–82.

—— 1942. Laboratory Production of the λ4050 Group Occurring in Cometary Spectra; Further Evidence for the Presence of CH_2 Molecules in Comets. Astrophys. Jour. 96: 314–315.

WILLIAM J. LUYTEN, University of Minnesota

Grant No. 579 (1941), $250. The measurement of the motions of 18,000 stars between declinations —40 and —50.

This grant was awarded to aid in the measurement and reduction of the motions of 18,000 stars with declinations between − 40 and

– 50. The motions of these stars were found by the writer from examination by the blink microscope of 144 pairs of plates taken with the 24-inch Bruce refractor of the Harvard Observatory. Most of these stars possess proper motions larger than 0".030 annually and have photographic magnitudes between ten and seventeen. With additional aid provided by the Graduate School of the University of Minnesota, the National Youth Administration, and the Works Progress Administration the measurement and the reduction of all these 18,000 motions have now been completed. Positions for these stars have likewise been determined and the photographic magnitudes estimated to the nearest tenth.

Owing to considerable overlapping of the plates in Right Ascension large numbers of stars were found, and their motions measured on more than one plate. Thus, it is estimated that the 18,000 measures refer to only 14,000 different stars. The certain identification of these duplicates and the comparison and averaging of their measures is a task of considerable magnitude but it must be completed before the data obtained can be assembled into the final catalogue. However, this analysis of these comparisons leads to valuable information on the accuracy of the measures and on the completeness of the survey.

Due to the exigencies of the war it has not been possible to finish this part of the reductions and the preparation of the final catalogue must therefore be postponed until this can be completed. Ultimately it is planned to publish the final results in the same form as those for the stars south of declination – 50.[1]

In order to aid parallax observers the few hundred stars with motions in excess of 0".300 annually which stars are of individual interest should be published separately. All stars with motions larger than 0".500 annually have already been published;[2] likewise those stars south of declination – 50 with motions between 0".300 and 0".500.[3] A similar catalogue giving the motions of 355 stars in the present zone with motions between these same limits has now been prepared and will be published shortly as No. 4 of Volume 3 of the Publications of the Astronomical Observatory of the University of Minnesota.

[1] Bruce Proper Motion Survey; The General Catalogue; Proper Motions of 28535 Stars south of declination — 50.

[2] Publ. of the Astron. Observ., Univ. of Minn. 3, 1–22 (1941).

[3] Ibid. 3, 23–32 (1941).

JOHN E. MERRILL, Hunter College

Grants No. 522 (1941), $600 and No. 611 (1942), $150. Computation of tables for solution of orbits of eclipsing binaries.

Direct comparison of tables computed independently by Merrill [1] and Zessewitsch [2] for the percentage obscuration of light during eclipse as a function of the relative radii and apparent separation of centers of the two uniform disks, showed the Zessewitsch work reliable but subject to some typographical errors. The Z tables for $\alpha^{1.0}_{occ}$ (p, k) and $\alpha^{1.0}_{tr}$ (p, k), $(+1.00 \geqslant p \geqslant -1.00$, p to 0.01, k to 0.05), were then spot-checked by direct computation at chosen places, differenced in both directions and errors corrected. In general these errors are typographical.

By appropriate interpolations between the M table $\alpha^{0.0}(p, k)$ and the Z $\alpha^{1.0}_{occ}(p, k)$ and $\alpha^{1.0}_{tr}(p, k)$ tables of $\alpha^{x}_{occ}(p, k)$ and $\alpha^{x}_{tr}(p, k)$ were derived for $x = 0.2, 0.4, 0.6, 0.8$ where x is the ratio of loss of light at the limb due to darkening, to light at center of disk, for the star-disk being obscured. Inversion of portions of these eight tables provided values of $p(k, \alpha^{x}_{occ})$ and $p(k, \alpha^{x}_{tr})$ for spot-checking and validating of the corresponding Z tables.

From the Z table X (k, q) (spot-checked by direct computation, differenced and validated), a table of $\alpha^{1.0}_{tr}(p, k)_{ann}(p \leqslant -1.00)$ and four $\alpha^{x}_{tr}(p, k)_{ann}$ were computed and thereby $p(k, \alpha^{1.0}_{tr})_{ann}$ and the four $p(k, \alpha^{x}_{tr})_{ann}$.

All such tables were validated by recomputation of some values and by differencing in both directions.

From the tables $p(k, \alpha)$ with careful attention to the denominators involved in the computations there were derived the corresponding tables $\psi(k, \alpha^{1.0}_{occ})$, $\psi(k, \alpha^{x}_{occ})$, $\psi(k, \alpha^{x}_{tr})$, $\psi(k, \alpha^{1.0}_{tr})_{ann}$ and $\psi(k, \alpha^{x}_{tr})_{ann}$ useful in solving orbits based on observations of less than photoelectric accuracy and for all preliminary solutions.

Lastly, tables of the χ-function for use in cases of partial eclipse have been computed from the appropriate values of ψ and/or p. These tables of $\chi(k, \alpha^{x}_{0,occ}, n)$ and $\chi(k, \alpha^{x}_{0,tr}, n)$ are given with differences for $n = 0.1, 0.2, 0.4, 0.6, 0.8, 0.9$ and 0.95, providing quicker and better determination of the partial-eclipse constants than was possible with the older $n = 0.25$ alone.

The tables of α are reliable to $\pm$ 1 unit in the fourth decimal and hence of ample accuracy for least-squares solutions where the ob-

[1] Filed at Princeton Univ. Observ., Dec. 1938.

[2] Bull. Inst. Astr. Leningrad No. 45, Feb. 1939; No. 50, Oct. 1940.

servations warrant; those of ψ are good to $\pm$ 2 units in the fourth decimal but will probably be published to the third only; the χ's are good to $\pm$ 1 unit in the third decimal.

Manuscript or typescript copies are being filed at the Princeton University Observatory for the present, and publication as a Princeton Contribution is being deferred until after the war. If in the meantime portions of some of the tables are needed, they will be furnished upon request.

PHYSICS

FORREST F. CLEVELAND, Illinois Institute of Technology

Grant No. 582 (1941), $693. Studies on the Raman spectra of Hydrocarbons.

Raman frequencies, relative intensities, and depolarization factors have been obtained for 1-octene, cis + trans 2-octene, trans-3-octene, trans-4-octene, 4-octyne, and 1-octyne. Some of the spectrograms were made with a Hilger E-518 spectrograph. Sharp lines could be measured to the nearest cm^{-1} while the overall accuracy was approximately 3 cm^{-1}. The speed of the instrument was such that, with a slit width of 0.08 mm and with Agfa Superplenachrome Press film, a spectrogram of CCl_4 upon which it was possible to measure frequencies for five Stokes and three anti-Stokes lines could be obtained in one minute. In the earlier work, trouble was experienced with motion of the film during the long exposures, with consequent broadening or doubling of the lines. A change to Eastman 103-J spectroscopic plates eliminated this difficulty.

The relative intensities and depolarization factors were obtained by use of a Gaertner microdensitometer. The scale reading on this instrument was proportional to the density. To calibrate the instrument, the Raman tube was replaced by a white cardboard and a small tungsten lamp, approximating a point source, was placed at various distances in order to get known relative intensities of illumination on the cardboard. One-hour exposures were made for each position of the lamp. A calibration curve was then made by plotting the densities (at a wave length corresponding to a Raman frequency of approximately 1400 cm^{-1}) against the relative intensities and finally a density-intensity table was prepared from this curve.

To obtain the true intensity of the Raman line, it was necessary to correct for the continuous background. This was done as fol-

lows: The density of the line D_L and the density of the background D_B were measured and the corresponding intensities I_L and I_B were read from the table. The true intensity of the line was then taken as $(I_L - I_B)$. Tests showed that errors in relative intensities and depolarization factors due to inaccuracy in setting the densitometer were, in general, about two per cent of the reported values.

Comparison of the relative intensities for 4-octyne with the estimated intensities previously obtained in this laboratory indicated that the so-called "estimated intensities" are really estimates of the densities rather than of the intensities of the lines.

The investigation was made to determine changes in the Raman spectra of straight chain hydrocarbons containing eight carbon atoms when the unsaturated bond occupies different positions in the chain. Frequencies characteristic of the $RHC{=}CH_2$ group in 1-octene were 1293(94)0.88, 1415(42)0.77, 1641(134)0.15, and 3078(23)0.93. (The number before, in, and after, the parenthesis is the Raman displacement in cm^{-1}, the relative intensity, and the depolarization factor, respectively.) The 1415 and 3078 lines did not appear in the spectra of the other three octenes and the double bond line was observed at 1672 (strong, sharp, polarized). A strong polarized line was observed for all the octenes at 2999 cm^{-1}. The triple bond line for 1-octyne appeared at 2118(865)0.14 and the polarized acetylenic hydrogen line at 3302(2). The triple bond line for 4-octyne was double, 2234(388)0.15 and 2294(65)0.10.

Cleveland, Forrest F., 1943. Raman Spectra of Hydrocarbons. I. 1-Octene, cis + trans 2-Octene, trans-3-Octene, trans-4-Octene, 4-Octyne, and 1-Octyne. Jour. Chem. Phys. 11: 1–6.

John Alvin Pierce, Harvard University

Grant No. 439 (1940), $750. Determination of the rates of recombination and diffusion of free electrons in the upper atmosphere.

The field work of the Harvard Ionosphere Eclipse Expedition, which was supported in part by the American Philosophical Society, was successfully completed in Queenstown, South Africa, in September and October 1940. The resultant data were partially analyzed in 1941, but war-time activities have delayed the publication of the material.

In a forthcoming preliminary paper it will be shown that recombination and diffusion cannot completely explain the phenomena

in the F_2 layer and that the cooling of the atmosphere by the eclipse may be of major importance. The behavior of both E and F regions showed that the solar ultraviolet energy responsible for their formation was not radiated uniformly from the whole solar disk. In the case of the E layer, in particular, an unexpectedly large amount of energy came from the extreme Western limb of the sun.

Minimum values of the apparent recombination coefficients for the E, F_1, and F_2 layers were $1.2 \cdot 10^{-8}$, $6 \cdot 10^{-9}$, and $6 \cdot 10^{-11}$ cm^3/elec. sec., respectively.

Some of the 1940 data show very interesting and unexpectedly detailed agreement with those, previously unpublished, which resulted from a similar expedition to Kazakstan, U.S.S.R., in 1936.

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

GEOLOGY AND PALEONTOLOGY

HENRY N. ANDREWS, JR., Washington University, St. Louis

Grants No. 524 (1941), $200, and No. 606 (1942), $200. Study of the Fossil flora of the Carboniferous rocks of southern Illinois.

Some few hundreds of coal-ball specimens have been collected during the past year from the Pyramid Mine of the Binkley Coal Company, Perry County, Illinois.

In collaboration with Mr. L. Wayne Lenz a study of certain fossil fungi, presumably of a mycorrhizal nature, has been completed. The fungi consist of hyphal filaments averaging about 1 micron in diameter which occur as dense masses in the cortical cells of the Carboniferous fern Scleropteris illinoiensis Andrews. In most cases the hyphae are clearly intracellular, forming a typically endophytic association. Various transitional stages have been observed from comparatively loosely organized mycelium distributed throughout the periphery of the cell lumen to smaller, dense, spherical bodies in which the individual strands tend to lose their identity. This is thought to be comparable with the progressive digestion of the fungus by the host cells as reported in living Orchids. In other cells the hyphae develop distinctive knotty outpocketings apparently representing specialized haustoria.

A few of the cortical cells of the host contain swollen bodies varying from fifteen to thirty-three microns in diameter. We believe these to be comparable to the vesicles described in present-day

mycorrhizae. It is quite possible in view of the morphological diversity presented by the hyphae that more than one species of fungus is represented.

The fourth contribution in this series of investigations (Pannell, 1942) is concerned with a new species of Lepidodendron, characterized chiefly by groups of sclerotic cells in the cortex. L. scleroticum is the dominant element in the coal-ball flora from the Pyramid Mine and was in all probability the chief contributor in the development of the present coal deposits.

A wide range of branch orders is contained in our collections, presenting steles from .26 to 8.12 mm. in diameter. The smaller ones are protostelic while the larger ones show stages in the development of mixed protosteles and siphonosteles with abundant secondary wood.

On the basis of association it seems probable that this species bore the seeds and microsporangiate cones previously described under the name of Lepidocarpon magnificum (Andrews and Pannell, 1942). Evidence is also advanced which suggests that Lepidodendron Volkmannianum Sternb., known as a "compression species" from the southern Illinois mines, may be identical with L. scleroticum.

ANDREWS, HENRY N., JR., 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 111–112.

—— 1942. Contributions to Our Knowledge of American Carboniferous Floras. I. Scleropteris, gen. nov., Mesoxylon and Amyelon. Ann. Mo. Bot. Gard. 29: 1–18.

—— 1942 (with PANNELL, ELOISE). Contributions, etc. II. Lepidocarpon. Ann. Mo. Bot. Gard. 29: 19–34.

—— (with LENZ, L. WAYNE). A Mycorrhizome from the Carboniferous of Illinois. Bull. Torr. Bot. Club. (In press.)

PANNELL, ELOISE. 1942. Contributions, etc. IV. A new species of Lepidodendron. Ann. Mo. Bot. Gard. 29: 245–274.

OREN F. EVANS, University of Oklahoma

Grant No. 527 (1941), $100. The origin of spits, bars, and related structures.

A "spit" is a ridge or embankment of sediment attached to the land at one end and terminating in open water at the other. It is younger than the land mass to which it is attached. The crest of the spit from the land outward for some distance rises above the water.

A "bar" is a completed or extended spit which encloses, or nearly encloses, a portion of the water body into which it extends. It may be attached only at one end, or it may be the result of two spits building from opposite directions. If such a bar extends across a bay it is called a "bay bar." If it departs from a relatively straight shoreline and then swings back it is called a "looped bar."

An "offshore bar" is a ridge or embankment of sediment lying approximately parallel to a shoreline and reaching above the water. It is not attached to the shore at either end. Like the spit and the bar, it is composed of unconsolidated material, and is younger than the land body along which it lies.

Studies were made of certain spits, bars, and looped bars while they were in process of formation to determine the source of sediments and the transportation processes which result in their formation. Shore currents often carry sediment and deposit it as subaqueous ridges but it is evident that this process which operates entirely within the water is not capable of building such ridges above the water. It has generally been assumed that subaqueous ridges in shallow water could be brought above the water surface by the action of waves moving perpendicular to the axis of the submerged ridge. This explanation which appears to have been first offered by de Beaumont, has received support from Shaler, W. M. Davis, and D. W. Johnson. However, Evans has shown [1] that under conditions of relatively constant water level waves do not cause subaqueous ridges to build above water but either leave the ridge unchanged or, under certain conditions, may convert it into a subaqueous dune.

The problem was attacked by selecting a number of spits, bars, and looped bars which were being formed and observing the processes of building over several months under various conditions of wind direction and wind action. It was found that the part of a spit or bar above water is an extended beach ridge and receives all of its material from the direction of its attached end by the process of beach drifting, i.e. by transportation through the agency of the swash and backwash. Spits and bars are increased in length when the wave direction is such as to cause movement of materials along the face of the beach ridge from the attached end out toward the free end of the structure. Waves from any other direction cause

[1] Evans, O. F. Low and Ball of the Eastern Shore of Lake Michigan. Jour. of Geol. 48: 5, 476–511. 1940.

the spit to be shortened or broadened. When waves reach the end of the spit they refract around it and cause beach drifting across its end and may thus form a hook. The tendency of this action is always to broaden the spit but whether or not a hook forms depends on the effective energy of the waves in relation to the amount of sediment available. The less the amount of sediment and the more strongly the waves are refracted across the end of the spit the more favorable are the conditions for hook forming.

With gentle under water slopes and abundant sediment, spitlike projections will build out from a straight shoreline. As these are extended outward toward deeper water and the wind and waves continue in the same direction, the end of the structure curves back toward shore and a looped bar is thus sometimes formed. Thus hooks and looped bars are formed by currents and waves coming from a constant direction and so it is not necessary to postulate change of wind direction to account for the formation of hooks and looped bars.

No opportunity was found to study offshore bars in the process of formation. Subaqueous ridges lying parallel to the shore are numerous in the area but no offshore bars are known.

Conclusions

1. The subaqueous ridges which constitute the submerged portion of spits and bars are not built up above a water surface of constant elevation by the work of waves throwing up material from the bottom.

2. Spits increase in length above the water only when the waves and the shore drift move from the direction of their land connection. Waves from any other direction tend to destroy them.

3. Hooks are a normal accompaniment of spit building, usually as the result of wave refraction. Neither change of wind direction nor the presence of tidal or hydraulic currents is necessary to their building.

4. The part of a spit above the water receives its material as the result of beach drifting. The direction the spit takes is determined by relations among the variables of current direction, wave direction, wave energy, amount of sediment, and depth of water.

5. A looped bar is built by the same processes that produce spits and hooks. In fact, a looped bar is only a hooked spit that has continued to build until it has rejoined the shore.

EVANS, OREN F., 1941. The Origin of Spits, Bars, and Related Structures. (Abstract.) Bull. of Geol. Soc. Amer. 52: 12, Pt. 2, 1999.

—— 1942. The Origin of Spits, Bars, and Related Structures. (Abstract.) Proc. Okla. Acad. of Sci. 22: 144.

—— 1942. The Origin of Spits, Bars, and Related Structures. Jour. of Geol. 50: No. 7, 846–865.

HORACE G. RICHARDS, Academy of Natural Sciences of Philadelphia

Grant No. 44—Johnson Fund (1942), $450. Completion of the studies on the geology and paleontology of the North Carolina Coastal Plain.

Because of the need for a survey of the economic resources of the Coastal Plain of North Carolina, a cooperative program was drawn up between the Academy of Natural Sciences of Philadelphia and the North Carolina State Museum for a geological and paleontological survey of this region with particular emphasis on the economic features. A grant from the Johnson Fund of the American Philosophical Society greatly aided this project. Most of the field work was carried out in the company of Mr. Harry T. Davis, Director of the North Carolina State Museum. Mr. Allen L. Midyette, Jr., was field assistant.

Among the resources recorded are sand, gravel, marl, clay, kaolin, building stone, ilmenite and glauconite. An unsuccessful attempt was made to find bauxite in the Tuscaloosa formation where it seemed possible that it might occur. Among the purely scientific results, the most significant was the discovery of an extensive new fauna from the Trent marl of Lower Miocene age. This is being described in a paper now in press. The field work was extended into South Carolina where a fauna of Late Pliocene or Early Pleistocene age was discovered in the excavations for the Santee-Cooper Project near Moncks Corners, S. C. A report on this fauna is also in press. It is hoped that a complete report on the project will eventually be published by the North Carolina State Museum.

The following table shows the present interpretation of the stratigraphy of the Coastal Plain of North Carolina. It is based upon a careful study of previous work, especially the report on the State Survey in 1912,[1] together with the results of the present field work.

[1] N. C. Geol. and Econ. Surv. Vol. 3, 1912.

Coastal Plain Formations of North Carolina

Pleistocene	Pamlico	marine; last interglacial
	Horry	low sea level; glacial
	Talbot	"Higher Terraces" no marine fossils
	Penholloway	
	Wicomico	
	Sunderland	
	Coharie	
Pliocene	Brandywine	[= "Lafayette"]
	Croatan	near Neuse River
	Waccamaw	near Cape Fear River
Miocene	Duplin	southern North Carolina
	Yorktown	north of Neuse River: Zone 2; Zone 1 "Murfreesboro stage"
	St. Mary's	buried; near Virginia line
	Trent	
Eocene	Castle Hayne	
	Black Mingo	locally at western limit of Coastal Plain
Upper Cretaceous	Peedee	
	Black Creek	including Snow Hill member
	Tuscaloosa	

The following remarks on the various formations show the changes in interpretation since the publication of the 1912 volume.

Cretaceous

Tuscaloosa Formation.

In the earlier report these deposits were regarded as being correlated with the Patuxent formation of Maryland, of Lower Cretaceous age. Later field work by Stephenson and others has shown that at least most of this formation is continuous with the Tuscaloosa formation of South Carolina to Alabama which is of basal Upper Cretaceous age. It is probably also equivalent to the Raritan formation of New Jersey. In North Carolina, the formation outcrops in stream valleys along the upper Roanoke and Tar Rivers and Contentnea Creek and then more or less continuously in a fairly wide band from Smithfield to the South Carolina line near Hamlet.

The Tuscaloosa is composed of sands, clays with some kaolin. No fossils are known from the formation in North Carolina although fossil plants are numerous in South Carolina and elsewhere.

Black Creek Formation.

The Black Creek is equivalent in part to the Ripley of the Gulf Coast. To the north, it is equivalent to the Mattawan and Magothy Groups of Maryland, Delaware and New Jersey.

The Black Creek outcrops in a belt southeast of the Tuscaloosa. In the Cape Fear River region it has a width of some thirty miles, but it narrows toward the north and in the Tar River region it is only about eight miles wide. It is best exposed along stream banks, especially the Cape Fear River, the Black River, the Neuse River, Contentnea Creek and Tar River. The formation is largely composed of thinly laminated sands and clays with a slight glauconitic content. Many fossils have been described by Stephenson.[1] Most of the old localities are inaccessible today. Only a few fossils, mostly fragments, were obtained at Snow Hill, Blue Banks Landing, Seven Springs and elsewhere.

The upper part of the formation from which most of the fossils have been obtained has been called the Snow Hill member by Stephenson and is thought to be equivalent to the upper part of the Exogyra ponderosa zone.

Peedee Formation.

The Peedee formation is equivalent to the Exogyra costata zone of Stephenson which comprises the Monmouth Group of Maryland and New Jersey. It outcrops in a belt east and southeast of the Black Creek formation and is best seen along the banks of the Cape Fear, Northeast Cape Fear, Black and Neuse Rivers and Contentnea Creek. It always occurs downstream from the Black Creek upon which it rests conformably. Its fauna, which has been carefully studied by Stephenson, is less extensive and can best be seen along the Lower Cape Fear River above Wilmington.

Eocene

Black Mingo Formation.

This is known only locally in North Carolina. Sandstone outcrops near Lillington, Harnett County, carry fossils similar to those from the Black Mingo of South Carolina. Similar sandstone occurs

[1] Stephenson, L. W., 1923, N. C. Geol. and Econ. Surv. 5.

locally elsewhere in Harnett and Hoke Counties. Fossiliferous outliers near Spout Springs, Harnett County, Clayton, Johnston County, and Auburn, Wake County, are tentatively referred to the Black Mingo although their fossils have not yet been completely studied. The Black Mingo is equivalent in part to the Wilcox group of the Gulf Coast.

Castle Hayne Formation.

This formation was first named by Miller in 1912. It was regarded as the youngest Eocene deposit in the State, overlying the Trent formation. At that time no extensive study had been made on its fauna. In 1926, Kellum[1] studied this fauna and showed that the Castle Hayne correlated with the Santee limestone of South Carolina and the Jackson formation of Mississippi. Furthermore it was shown that the Trent marl was actually younger than the Castle Hayne and apparently overlay it. At the same time it was shown that numerous localities referred by Miller to the Trent, for example along the Trent River, actually contained Castle Hayne fossils. The present survey has covered all previously known localities and has added numerous new ones.

The Castle Hayne formation extends from Wilmington northeast to the Neuse River and just beyond. In many places it consists of finely ground calcareous marl which is often between ninety and one hundred per cent calcium carbonate. Locally the Castle Hayne has been quarried for crushed and dimension stone. Near Belgrade and Maysville on the White Oak River the Castle Hayne occurs up to thirty feet in thickness and is extensively quarried for stone aggregate. At Pollocksville a phase of the formation occurs which is almost entirely composed of fragile whole shells of Ostrea georgiana. Fossils are abundant especially near Castle Hayne, Belgrade and Dover. At the latter two localities the fauna is exceptionally rich and while it has not yet been carefully studied, it is most probable that it contains a number of new species.

Miocene

Trent Formation.

The formation was named by Miller from the Trent River in North Carolina along which stream it is exposed. Miller gave no type locality, but mentioned that it occurred along that River from Trenton, Jones County, to near its junction with the Neuse River.

[1] Kellum, L. B., 1926, U. S. Geol. Surv. Prof. Paper 143.

Very few fossils were reported and the formation was regarded as being of Eocene age lying beneath the Castle Hayne, although the contact had not actually been observed.

Kellum restudied the Castle Hayne and Trent marls in 1926 and, from an analysis of the fossils, established that the Trent was of Lower Miocene age. Of the twenty-three localities listed by Miller as Trent, seven failed to yield any fossils, and seven proved to be Castle Hayne. It was therefore necessary to redefine the boundaries of these formations. The name Trent can be retained for the formation, although it extends along the Trent River only from its junction with the Neuse to just below Pollocksville, the deposits along the upper Trent being Castle Hayne. The Trent formation is exposed west of the Castle Hayne in a narrow north and south belt between the New and Neuse Rivers. In most places it is a consolidated marl and the fossils occur in the form of casts. Thus it is exposed near New Bern and Jasper on the Neuse River, at White Rock Landing on the Trent River, and at Jacksonville on the New River. Locally the Trent is unconsolidated and resembles younger marls such as the Yorktown. Near Pollocksville (Simmons Pits) it occurs as a finely ground shell marl with few perfect shells, while near Silverdale, the shells are perfect and well preserved. It is at this latter locality that a fauna of fifty-three species was obtained; of these twelve are being described as new. A study of this fauna clearly shows that the Trent marl is closely related to the Tampa limestone of Florida, of Lower Miocene age.

One of the most interesting species from Silverdale is a new Donax, not related to any East Coast species, but very close to D. punctostriatus Hanley from the Gulf of California and the West Coast of Mexico. This new Donax can be added to the small list of species known from the Miocene of the East Coast and related to Recent species from the West Coast of Mexico. These are thought to indicate the existence of a marine passage across the Isthmus of Tehuantepec during some part of the Tertiary.

St. Mary's Formation.

Miller mapped this formation as extending over a considerable area in northeastern North Carolina as well as in adjacent Virginia. Later, Olsson pointed out that this fauna was distinct from the true St. Mary's of Maryland and he therefore designated it as the "Murfreesboro stage." Since this name was preoccupied, Mansfield re-

ferred it to the basal part of the Yorktown formation. It is possible that the true St. Mary's formation occurs beneath the surface in northeastern North Carolina, although no evidence for it has been found during the present survey.

Yorktown Formation.

Sands and marls of the Yorktown formation outcrop over a considerable area in northeastern North Carolina. The lower portion ("St. Mary's" of earlier reports) outcrops along the Meherrin, Roanoke and Tar Rivers and sparingly along the Neuse River and locally elsewhere. Its western limits are about on a line from Weldon through Halifax, Enfield, Rocky Mount and Wilson to Goldsboro. To the east it dips beneath the later Yorktown (Zone 2) along a line approximately through Winton, Williamston, Washington and Kinston. The later Yorktown (Zone 2) occurs in discontinuous patches and is especially developed along the Chowan, the lower Roanoke, the lower Tar, the lower Neuse and tributaries. Although the Yorktown formation is not mapped south of the Neuse River, it is thought that the Duplin formation is equivalent to the upper part of the Yorktown. Various zones of the Yorktown have been worked out by means of paleontological studies, but these are probably of more or less local significance.

In addition to numerous excellent fossil exposures along streams (such as Palmyra Bluff and Hamilton Bluff on the Roanoke River; Watson's Mills on Kirby's Creek; near Murfreesboro on the Meherrin River; Colerain and Black Rock on the Chowan River; Shiloh Mills on Tar River and Rock Landing on the Neuse River), excellent fossils have also been obtained from active marl pits near Maury, Fort Barnwell, Williamston, etc.

The Yorktown formation is the upper part of the Chesapeake group and is of relatively late Miocene age.

Duplin Formation.

The Duplin marl occurs locally in the southern part of the State. It is best developed near Magnolia, Duplin County, but is also present in Sampson County near Clinton, in Bladen County near Elizabethtown, in Robeson County near Lumberton and Fairmont, and in Columbus County near Lake Waccamaw. An extensive fauna of over three hundred species has been listed from the Natural Well in Duplin County, while other good material has been obtained at Tar Heel, Elizabethtown and Lake Waccamaw. The

fossils, while indicating warmer water, suggest that the Duplin marl is equivalent to the upper part of the Yorktown formation.

Pliocene

Waccamaw Formation.

In North Carolina the Waccamaw formation outcrops only south of the Neuse River and is best exposed at several places along the Cape Fear River. It is also exposed as a very thin upper layer along the north shore of Lake Waccamaw. The Croatan beds in the vicinity of the Neuse River may be contemporaneous or may be slightly younger. Waccamaw fossils have been reported from a well at Lake Landing, Hyde County and shells of questionable Pliocene age have been dredged from the Dismal Swamp Canal near South Mills, Camden County. These are the farthest north that any marine Pliocene fossils have been found along the Atlantic Seaboard and it is thought that the Pliocene shoreline crossed the present shore line somewhere between Cape Hatteras and Cape Henry.

Lithologically, the Waccamaw marl resembles that of the Yorktown. The best fossils were obtained from marl pits at Acme, Tar Heel (upper level), from a road cut near Elizabethtown and the banks of the Cape Fear River at Walkers Bluff and Neils Eddy Landing.

The Waccamaw fossils correlate with the Caloosahatchee beds of southern Florida and are thought to represent an early phase of the Pliocene.

Croatan Formation.

The Croatan fossiliferous sand is best observed along the Neuse River between James City and Cherry Point and from excavations for the Intra-Coastal Canal near Beaufort. It also occurs locally southwest of the Neuse River in Craven and Onslow Counties and has been dug as marl near Kuhns and Silverdale near the White Oak River. The Croatan sand is probably equivalent to the upper part of the Waccamaw, although it may be slightly younger. Fossils are abundant near James City, Silverdale, Beaufort and Padgett.

Brandywine Formation.

This name is now used to include most of the deposits referred to by earlier workers as "Lafayette." This formation covers a

discontinuous surface ten to thirty or forty miles wide on the northwest border of the Coastal Plain. The inner margins have not been mapped, but there are scattered beds of gravel and cobbles far to the west of the Fall Line that are probably equivalent to the Brandywine. The southeast boundary of the Brandywine is frequently limited by a seaward facing escarpment but this is not always clearly marked. Whether the Brandywine be of marine or fluvial origin is still an open question although in view of the coarse nature of the sediments and the lack of fossils, the present author prefers to accept the fluvial origin. Also it is uncertain whether the Brandywine represents the late Pliocene or the earliest Pleistocene. It is possible that the Brandywine as mapped at present in North Carolina is actually composed of more than one formation. The Brandywine is best developed near Lilesville, Anson County, where sand and gravel deposits occur up to sixty feet in thickness and are extensively dug for commercial purposes.

Pleistocene

"Higher Terraces."

The Pleistocene deposits of North Carolina consist of gravel, sand, silt and clay ranging in thickness from a few feet to a score or more. At many places these form terraces with what may be considered to be a low wave cut bluff or beach ridge at the landward margin. A series of these terrace remnants ranges from twenty-five to two hundred and seventy or more feet above sea level. The higher ones are largely discontinuous and patchy, while the lower ones are fairly continuous broad stretches of flat country, thirty to fifty miles wide.

Three main theories have been advanced to explain the origin of these terraces;—one that they are largely of marine origin, another that they are predominantly of fluvial origin, and thirdly, the combination of the two. The marine origin of the lowest terrace-formation (Pamlico) is easily demonstrated because of the abundant marine fossils. The origin of the "higher terraces" can only be determined by physiographic studies since no Pleistocene fossils, other than a few vertebrate and plant remains, are known from North Carolina above the twenty-five foot level.

In the present survey relatively little attention has been paid to the Pleistocene deposits older than the Pamlico, and no attempt has been made to redefine the terraces. No attempt will be made

here to settle the problem of the origin of the terraces, although it might be said that the present writer, being primarily a paleontologist. likes to see marine fossils before he is entirely convinced of the marine origin of a formation. On the other hand the wave cut appearance of some of the scarps is almost equally convincing. The classification of the Pleistocene as given in Table 1 is largely based upon the works of C. W. Cooke.

The marine fossils from the Santee-Cooper area in South Carolina may be from the Penholloway formation, or from an underlying late phase of the Pliocene.

Horry Clay.

This formation was described by Cooke from a section of the Intra-Coastal Canal near Myrtle Beach, S. C. It is believed to represent a low stand of the sea immediately preceding the deposition of the Pamlico terrace-formation. A similar clay deposit occurs along the south bank of the Neuse River about ten miles below New Bern, N. C.

Pamlico Formation.

The lowest terrace-deposit is definitely of marine origin and underlies all of Eastern North Carolina less than twenty-five feet in elevation. This formation, the Pamlico, consists of sandy loams, sand and clay, with local deposits of coquina near Cape Fear. It is believed that the Pamlico dates from the last major interglacial stage and can be correlated with the Cape May formation of New Jersey and the Anastasia of Florida. Fossil invertebrates are abundant aid can best be obtained from excavations for the Intra-Coastal Canal near Fairfield, Hyde County, the Dismal Swamp Canal near South Mills, along both sides of the Neuse River about ten miles below New Bern, and in the coquina phase near Carolina Beach. A significant new Pleistocene locality was discovered near Nicanor, Perquimans County, near the western edge of the Dismal Swamp.

Richards, Horace G., 1942 (with Davis, Harry T.). Reviewing North Carolina Coastal Plain Geology [abstract]. Jour. Elisha Mitchell Sci. Soc. 58, 136.

—— Pliocene and Pleistocene Fossils from the Santee-Cooper Area, South Carolina. Notulae Naturae, Acad. Nat. Sci. Phila. (In press.)

—— Additions to the Fauna of the Trent Marl of North Carolina. Jour. Paleont. (In press.)

—— Geology of the Coastal Plain of North Carolina. Typewritten manuscript submitted to the North Carolina State Museum, Raleigh, N. C. (202 pages).

TENG-CHIEN YEN, California Academy of Sciences

Grant No. 41—Johnson Fund (1942), $1,200. Studies of Chinese mollusks preserved in various museums of natural history in the United States, in preparation of a *Manual of Chinese Mollusks.*

In giving a complete review of Chinese mollusks preserved in various institutions abroad, the present writer would like to summarize here briefly, first of all, the present existence of a number of important collections.

Most of the specimens collected by the British naturalists and practically all contained in the Cuming collection are now well preserved in the British Museum (Natural History). These series of material were formerly studied by Gray, Pfeiffer, Adams brothers, Reeve, G. B. Sowerby, his son and grandson, E. A. Smith, and others. The collection of Theodor Cantor, which was mostly described by Benson, is preserved in the cabinet of the Indian Museum at Calcutta and some in the British Museum. However, many of the duplicate examples of Benson's species are found in MacAndrews's collection now in possession of the Zoological Museum in Cambridge University.

The collection of von Richthofen was studied by von Martens and the specimens are now deposited in the Zoologischen Museum in Berlin. The most important collection of Chinese land and freshwater mollusks ever brought together belongs to the Natur-Museum Senckenberg in Frankfurt a. M. This cabinet was formed by the collections of a few well known conchologists of the last century such as Boettger, Moellendorff, Kobelt and Reinhardt, and which was recently enriched by adding that of Erhmann.

The material collected by Fuchs and a few other Catholic missionaries, which were studied by Gredler, is mostly preserved in Bozen, but duplicate examples of many of Gredler's species, apparently of paratypoid value, are available in the Natur-Museum Senckenberg and some in the British Museum. The specimens collected through Szechenyi's Eastern Asian Expedition, which were studied by Hilber, Neumayr and others, are now in the National Museum of Natural History in Budapest. Those collected

by Obrustchew and studied by Sturany are now in the Museum of Natural History in Vienna.

Pere David's collection, which was studied by Deshayes and subsequently by Ancey, is now in the National Museum of Natural History in Paris. Some incidental lots of species described in the *Journal de Conchyliologie* are partly in the special collection of that *Journal* and partly in that of Dautzenberg. The former is now preserved in Paris, while the latter is in the Musée Royal d'Histoire Naturelle in Bruxelles.

The large collection of marine mollusks by Stimpson of the United States North Pacific Exploring Expedition was partly in the New York State Museum and partly in the United States National Museum. A number of the lots was lost. These species were mostly described by Gould and a few by Stimpson himself. The United States National Museum possesses a rich cabinet of Chinese mollusks, particularly the collection made by Graham from West China in addition to a large number of duplicates from Heude's original lots. Those species described by Pilsbry from the collections of Y. Hirase and Brooke Dolan II are now preserved in the Academy of Natural Sciences of Philadelphia. The cabinet of the Academy contains also a large number of Chinese species from other sources. The California Academy of Sciences possesses a good number of Chinese forms of mollusks and their collection was further enriched by adding a large series of specimens from Chekiang Province. A systematic study of that series was completed late last year.

Since the completion of the paper on the Mollusks of Chekiang, the preliminary step of the work in correlating and comparing the molluscan fauna of China in various institutions abroad may be considered to be concluded. However, the writer is aware that some series of material contained in private or public collections in different places may have escaped his attention, particularly many of the species described by R. A. Philippi; the whereabouts of its original lots needs further search. It is possible that they had been brought to Chile, where this well known naturalist was lately appointed to the Directorship of the National Museum in Santiago and spent his remaining years abroad. However, it has not been confirmed in response to an inquiry by the present writer to that Institution.

With minor omissions, the work of review in general may be regarded as satisfactory. It has enabled the writer to produce a list of Chinese mollusks, which is now in completion. Loricata contains 4 species in 2 genera of 1 family; Gastropoda contains 136 species in 40 genera and 12 families of Scutibranchiata; 1,043 species in 208 genera and 57 families of Pectinibranchiata; 61 species in 28 genera and 20 families of Opisthobranchiata; and 1,083 species in 101 genera and 27 families of Pulmonata; Scaphopoda contains 14 species in 4 genera and 2 families; Pelecypoda contains 276 species in 84 genera and 40 families; Cephalopoda contains 20 species in 6 genera and 4 families. Among the five classes, Gastropoda is perhaps more completely recorded than any of the other groups.

In proceeding to the preparation of this list, the early months of the present year were spent in reviewing the Tertiary and Quaternary Mollusks of China, as it has been considered that such a work would be a useful basis for comparison and, furthermore, a considerable number of the early records need correction. The results are embodied in a manuscript of fifty-four pages. Following that work, a preliminary revision of Chinese species of Viviparidae (see bibliography 3) has been worked out. Hitherto the species of this family were assigned to the Genus Viviparus (sensu lato), including the species of Cipangopaludina. Some forms of that genus are not uncommonly found, evidently being introduced from Eastern Asia, on the Pacific coast of North America and some records had even been noted as far east as the vicinity of Chicago.

From June to August, the writer made a visit to the State University of Washington in Seattle and molluscan species of nearby lakes were investigated for the purpose of comparison. In September, he took a journey eastward from Seattle, via New Orleans, Washington, D. C., and Philadelphia, to New Haven, where the months of late September to the end of November were spent in the Peabody Museum of Natural History of Yale University. The work was mainly in preparing an Index Molluscorum Sinarum, and a bibliography on the studies of Chinese mollusks. This work is now under final revision with the use of the library facilities of the Academy of Natural Sciences in Philadelphia, and is comprised of a manuscript of about three hundred pages.

YEN, TENG-CHIEN, 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 144–146.

—— 1942. A Review of Chinese Gastropods in the British Museum. Proc. Malac. Soc. London 24: 170–289, 18 plates. (This work was carried on in the British Museum during 1939 and 1940.)

—— 1943. A Preliminary Revision of Chinese Species of Viviparidae. Nautilus 56. (In press.)

ANATOMY AND ZOOLOGY

RUDOLF ALTSCHUL, University of Saskatchewan

Grant No. 469 (1940), $300. A. Distribution and topography of the tortuous vessels in the brain, their individual variations and possible connection with brain diseases, especially with the bleeding and softening; B. Distribution of lipofuscin in human brain, especially in the basal ganglia.

(A) *Lipofuscin Distribution in the Basal Ganglia.*

The results of this research will soon be published.

The choice of the staining method for demonstrating lipofuscin is of importance since the various methods frequently give different results. It is shown that the silver reaction does not always conform with the reaction of gentian violet or fat stains.

The larger cells of the globus pallidus show this discrepancy very clearly, since their lipofuscin is hardly blackened by silver, but stains well with gentian violet and still better with fat stains.

The nerve cells of the putamen, caudatum and amygdaloid nucleus show a uniform reaction with silver, gentian violet and fat stains.

Using the three staining procedures, the reticulate zone of the substantia nigra, the substantia innominata and the corpus subthalamicum give characteristic reactions. These results confirm the opinion that the distribution of lipofuscin shows a characteristic topography.

(B) *The Convoluted Vessels of the Human Brain.*

The investigation of the convoluted vessels in normal and pathological brains has made little progress owing to lack of adequate material. But meanwhile an attempt has been made to improve the technique. It has been found that in sections not thicker than 10 μ and stained with hematoxylin-eosin or Mallory's aniline blue-orange G, the convoluted vessels can be found in the border zone between gray and white substance. They are of course not as distinct as in sections of 100–200 μ, stained with benzidine or acid

fuchsin or observed in decentralized light. They are readily found in the thin sections if cut longitudinally. If on the other hand they are cut transversally, sections of the same vessel will appear in the field several times. The employment of the thin section technique involves possibilities of error: the cross sections of vessels, even if very close together, may belong to different vessels and not to one single convoluted vessel. However, it is not to be expected that several vessels of the same caliber would be found close together in the border zone between gray and white substance. A convoluted vessel, if cut perpendicular to its main course, may appear in some section but once and thus escape attention. But if several slides of the same area are examined, sections of the same vessel would be observed several times and it would be recognized as convoluted.

The advantages of the thin section technique are that the sections are more easily handled and permit a detailed study of other tissues. Once the attention has been directed to special areas by the thin section technique, the investigation can always be completed by thick sections.

Altschul, Rudolf, 1943. Lipofuscin Distribution in the Basal Ganglia. Jour. Comp. Neur. 78: No. 1, 45–57.

Thomas Hume Bissonnette, Trinity College

Grant No. 384 (1939), $500. Photoperiodicity in animals.

For over three years, two short-tailed weasels (Mustela cicognanii cicognanii Bonaparte), similarly fed and cared for under temperatures 40–70° F., were subjected to controlled daily periods of available light. Both maintained normal molts and color-cycles on normal light-cycles. Normal pelt-cycles were resumed following return to normal days after experimental light-manipulations. Molting, followed by growth of more or less white pelt, followed shortening daily light periods, even in March-April, when control in the same room on normal days turned brown. While experimentally lighted, one passed a summer in piebald coat after incomplete color-change in both directions, and in almost complete white the next summer on normal days, followed by normal autumn molt to complete white and a spring molt to nearly complete brown coat. One whitened in October on short days, and returned to brown in December on long days. The other responded likewise

under similar light-manipulation. Gradually or suddenly shortened days induced whitening; lengthening days, brown, regardless of previous color. Molting was stopped short of completion by appropriate lengthening or shortening of daily periods of available light. Temperature changes did not condition these differences. Changes in daily lighting constituted the major factor inducing and controlling these molts and color-changes in these Pennsylvania-bred weasels studied in Connecticut.

This investigation was aided also by a grant from the American Academy of Arts and Sciences in 1942.

BISSONNETTE, T. H., 1942 (with BAILEY, E. E.). Experimental Modification of Molts and Coat-color-changes by Controlled Lighting of the Short-tailed Weasel. Biol. Bull. 83: 294.

JOHN B. BUCK, University of Rochester

Grant No. 520 (1941), $300. Problems in the distribution and light organ structure of Jamaican lampyrid fireflies.

I. Geographical and altitudinal distribution

Nearly two thousand specimens of lampyrid fireflies collected in Jamaica in 1941 have been prepared (genitalia extracted) and mounted for taxonomic study. Most of these have been identified by means of Barber's [1] key, and their geographical and altitudinal distributions studied. Seven or eight new species were collected, but their descriptions, and the clarification of certain minor difficulties in the key, will be considered elsewhere.

About 25 species were collected in sufficient numbers and in enough localities to permit the drawing of tentative conclusions as to their distributions, at least during the summer months. Geographically, the following main types of distribution were noted:

1. Species restricted to the Blue Mountains: Photinus alticola, ceratus, flavolimbatus, gracilobus, nothus, xanthophotis catherinae, and probably the melanurus-variabilis complex; Diphotus bucki, montanus, semifuscus and unicus. Photinus euphotus and lucernula probably belong here also, although a few similar coastal forms, perhaps of a subspecific nature, were found.

2. Species distributed widely, except for the Blue Mountain and other east end regions: Photinus naevus; Diphotus ornicollis.

3. Species generally distributed over the whole island, though only to 4000 or 5000 feet in the Blue Mountains: Photinus com-

[1] Proc. Rochester Acad. Sci. 8: 1–13 (1941).

missus, pallens, the leucopyge-melanopyge complex, blackwelderi, the lobatus complex, and the evanescens complex; Photuris jamaicensis.

4. Miscellaneous: Photinus synchronans occurs in the central and eastern parts of the island at low altitudes; Photinus xanthophotis (s.s.) is probably confined to the central uplands.

Altitudinally there occur similar groups of species of restricted distribution, as follows, the limits being given roughly:

1. 5000 to 7300 feet: Photinus alticola; Diphotus bucki and semi-fuscus.
2. 3500 to 6000 feet: Photinus flavolimbatus, lundi (?), nothus and xanthophotis catherinae; Diphotus unicus.
3. 2500 to 5000 feet: Photinus ceratus, gracilobus, the melanurus-variabilis complex, and probably Diphotus montanus.
4. Sea level to 5000 feet: Photinus commissus, euphotus and probably evanescens and pallens and Photuris jamaicensis.
5. Sea level to 3500 feet: Photinus lucernula and lobatus.
6. Sea level to 2000 feet: Photinus naevus, synchronans, xanthophotis and the leucopyge-melanopyge complex; Diphotus ornicollis.

Both geographical and altitudinal distributions thus show, first, a definite limitation in range for a given species, though considerable variation in extent between different species; and second, a distinct tendency for groups of species to be associated into populations which are characteristic of a given region or altitude. Whether these records will shed light on the method of evolution of new species, or upon their dispersal paths during the geological history of the island, are important questions which must await the completion of the study of anatomical affinities now in progress.

On the basis of the smaller collection available in 1936, Barber had distinguished four sub-species of Photinus evanescens. The present collection provided large enough samples from several localities to permit a statistical analysis of the problem. This is presented in some detail, since it has considerable bearing on the mechanism of speciation. The dimensions of the adaegus, or male copulatory organ, were chosen for analysis, since they are easily measured, and because the ordinary taxonomic characters (marking, shape and coloration of pygidium, pronotum, elytra, tergites, sternites, etc.) proved much more variable and difficult to assess quantitatively. Moreover, on physiological and evolutionary grounds, the adaegus might be expected to be one of the most constant body

structures. Body length and four adaegal dimensions in six populations of Photinus evanescens are presented, with their standard errors, in the table. The adaegus measurements are given in arbitrary units.

Locality	Location and Elevation	No. Spec.	Body length (mm.)	Length lateral lobe	Width adaegus	Length median lobe	Depth of central notch
Chestervale	Blue Mts. 3500 ft.	77	7.5±.1	14.6±.1	10.9±.09	9.9±.09	10.6±.2
Port Antonio	N. E. coast 50 ft.	29	7.1±.07	15.1±.1	11.4±.12	11.9±.15	10.3±.2
Stony Hill	E. central 1100 ft.	16	6.6±.09	12.1±.18	10.2±.13	8.4±.19	9.2±.23
Mandeville	W. central 2000 ft.	18	6.5±.12	12.2±.15	10.2±.15	8.3±.16	8.1±.2
Belmore Castle	W. central 1400 ft.	40	6.3±.07	11.9±.1	10.1±.08	8.2±.12	8.1±.09
Montego Bay	N. W. coast 50 ft.	26	6.4±.01	12.1±.2	10.2±.02	8.7±.14	8.2±.17

The significance of the differences between the various means was tested in the usual fashion for small samples, using their standard errors and *"Student's" t Table.* In the interests of brevity only those pairs having *t* values of less than 0.05 (one chance in twenty of getting as large a difference by chance alone) will be reported:

1. In body length, lateral lobe length, adaegus width and median lobe length, the Port Antonio and Chestervale populations differed significantly from one another and from the other populations.

2. The Stony Hill population differed significantly from all other groups in depth of the central adaegal notch.

3. The Belmore Castle, Mandeville and Montego Bay populations (which are close together, geographically) were indistinguishable in all respects save length of median lobe, in which the first and last mentioned differed significantly from each other (but not from either Mandeville or Stony Hill).

These results lead to the conclusion that during evolution the "species" Photinus evanescens (and presumably others) has broken up into local races, which, if sufficiently separated in space (and by inference, in time) have come to differ significantly from one another as populations in morphological characters. The roles of migration, mutation, geographical, and climatic isolation, etc. in this

process are unknown. Since, presumably, a sufficient number of samples at intermediate points would bridge, as a continuum, the gaps between the populations here analyzed, and since the differences considered are significant only as applied to population averages and not to individuals, it is considered better not to accord the different populations sub-specific rank until more weighty evidence of diversity is available.

The extensive assistance, in this investigation, of Mr. Albert Daniels, is acknowledged with pleasure.

II. Comparative histology of light organs

Several hundred histological preparations have been made of the light organs of twenty-five species of Jamaican fireflies. Special techniques, not ordinarily applied to photogenic organs, were used, including: impregnation with osmium tetroxide (by having the animal breathe the vapor), teasing and mounting in glycerin jelly; impregnation with silver nitrate, teasing in glycerin and reducing in sunlight; methylene blue, followed by smearing and fixation in ammonium molybdate; fresh smears in Ringers; dried smears; fixation in various hot solutions.

In both sexes of all species of Photinus and Photuris studied, the light organs correspond to Dahlgren's (1917) third type, in which the tracheal trunks run vertically through the reflector layer, and upon entering the photogenic layer are surrounded by cylindrical wells containing the tracheal end cells and encircled by one or more rosettes of photogenic cells. The trunks are of constant diameter throughout, and supply the tracheoles via numerous short lateral branches in the cylinder, at right angles to the trunk. There are, however, enormous variations in structural proportions and details in different species, and each form has a constant and characteristic plan. Among these variations are: (1) The thickness of the photogenic layer, both comparatively and in number of cell layers. For example, in Photinus evanescens this layer is usually one or two cells thick; in Photuris jamaicensis and Photinus variabilis, three to four; in Photinus xanthophotis catherinae and P. synchronans, five; and in Photinus pallens, six to eight. Likewise, the relative thickness of reflector and photogenic layers varies, respectively, from two and a half to one in Photinus evanescens to equality in P. pallens. (2) Although only one cell layer intervenes horizontally between contiguous tracheal cylinders, the sizes of these cells differ greatly in different species and bring about a

corresponding difference in number of tracheal trunks per unit area, as best seen in tangential sections. Thus, in Photuris jamaicensis and Photinus pallens, for example, the cylinders tend to be widely separated, whereas in Photinus xanthophotis catherinae they are closer together. (3) Another variation, also affecting tracheal spacing, is the diameter of the cylinder itself. Thus in P. xanthophotis catherinae the cylinders are very narrow, with the end cells clustered closely about the tracheal trunk, whereas in P. evanescens the cylinders are extraordinarily broad, and densely packed with end cells. There is, moreover, some evidence that the profusion of arborescence of the trunk itself is inversely proportional, roughly speaking, to cylinder length. Other variations in arrangement are exhibited by Photinus pallens, in which the cylinder tends to be confined to a bulge around the trachea in the interior of the photogenic layer, and in Photuris jamaicensis, in which the cylinders flare at one or both surfaces of the photogenic layer, so that the end cells seem to originate directly on these surfaces.

In Pyrophorus plagiophthalamus, and in the remarkable new genus Diphotus, the light organs are built on an entirely different plan from the adult organs in the genera Photinus and Photuris described above. In this second type of organ, both reflector and photogenic layers are composed of a variable number of very irregular layers of closely packed cells, and the tracheal trunks have no cylinders, but run directly into the tissues and branch profusely in progressively finer ramifications. The absence of end cells in organs of this type, previously reported for Pyrophorus, has been established conclusively, using particularly the osmic vapor technique.

The Diphotus organ type is of particular interest in two respects: (1) The photogenic tissue is in two small circular organs on the eighth abdominal sternite, instead of occupying most of the sixth and seventh sternites as in (males of) Photinus and Photuris. The arrangement in Diphotus, however, corresponds precisely to that in larvae of Photinus and Photuris, and is further confirmed in that the latter have a histological structure characteristic of Diphotus, rather than of the adult Photinus and Photuris. These facts lead to the interesting speculation that the Diphotus type of organ is a more primitive forerunner of the Photinus-Photuris type, and that the genus Diphotus is thus evolutionarily less advanced than the latter genera. (2) All species having the end cell type

of structure (adult Photinus and Photuris) invariably emit their light in intermittent flashes, whereas all forms lacking end cells (Diphotus, Pyrophorus, larval Photinus and Photuris) invariably emit their light as a long-sustained and steady glow. These facts indicate very strongly that the end cell functions in some way as a valve for the admission of oxygen to the site of luminescence, as claimed by Dahlgren,[1] but disputed by Maluf.[2] Further support for this conclusion was seen in formalin fixed preparations of Photinus stained with Mallory's triple stain, in which fibrous structures around the end cells were observed, resembling the "contractile valves" of Dahlgren.

The destination of the ultimate tracheoles originating at the end cells has long been in dispute, some holding that they run between the photogenic cells, and others that they actually penetrate the cytoplasm. In no species here studied was any evidence found of intracellular penetration, and in most forms it is clear that the tracheoles, which arise in pairs, are confined to the region of the cell membrane or intercellular spaces, and run directly and continuously from one tracheal trunk to another. Particularly clear evidence comes from silver nitrate impregnations, in which the reduced silver clearly delineates the tracheoles, and following Mallory, which gives a differential stain for tracheoles. In the silver preparations, moreover, it can often be seen that very minute, but very profuse, networks interconnect various tracheoles, and that these networks are confined to the region of the cell membrane. We thus see the photogenic cell as inclosed in a basket or network of still finer anastomosing branches from the "ultimate" tracheoles, through which oxygen diffuses into the cell.

J. Wendell Burger, Trinity College

Grant No. 590 (1941), $500. Factors of the external environment which modify the sexual cycles of vertebrates (principally the bird).

Three lines of investigation on the european starling (Sturnus vulgaris) were followed. These are summarized below (*a*, *b*, *c*).

(*a*) A study begun with T. H. Bissonnette under grant No. 384 was completed. The problem under consideration was whether or not light as light is the primary stimulus for photoperiodic sexual

[1] J. Franklin Inst. 183: 593–624 (1917).
[2] Amer. Entom. Soc. 31: 374–380 (1938).

activation in the male starling. Many ornithologists believe that light merely induces a state of wakefulness. This wakefulness, it is thought, is the primary activating stimulus.[1, 2] Experiments [3, 4] in which birds were mechanically agitated in darkness (thereby producing wakefulness) did not induce sexual activation. These latter experiments have been criticized on the grounds that the conditions of the experiments produced a state of fright and exhaustion which, it is assumed, inhibited the normal activity of the bird.

We devised a number of unalarming experiments where birds were exposed to flashing light. The flashing light kept the birds awake. In most experiments a daily program of 14 hours of illumination was employed. Control birds on uninterrupted illumination were tested against birds on various intervals of flashing light. It was found that the testicular response did not depend on wakefulness. Starlings kept awake for 14 hours daily by flashing light developed sperm only when the periods of illumination were 0.9 second or more and when the intervals of darkness between flashes were less than 15 seconds. For example, flashes of 0.1 second between intervals of darkness of 5 seconds were not activating sexually. Flashes of 5 seconds duration between intervals of 15 seconds of darkness were not activating. It is concluded that wakefulness *per se* is not the primary stimulus for sexual activation. Since the testicular response is related quantitatively to the lighting program, it is concluded on the basis of the above and other evidence (cf. *c*) that light as light initiates the activity of the gonad-stimulating mechanisms. This does not mean that other factors do not play auxiliary roles.

(*b*) It was shown that for the female starling, that light played a less significant role in the activation of the ovaries than in the activation of the male's gonad. Experimental modification of the female's environment did induce marked ovarian development, but did fail to induce completely mature oocytes. Since in earlier experiments the birds were confined to small cages, it was inferred that normal courtship, etc. was impossible. A total of eight pairs of birds were released in a room of approximately 4800 cu. ft.

1 Rowan, Wm. Biol. Rev. 13: 374–402 (1938).
2 Wolfson, A. Condor 43: 125–136 (1941).
3 Bissonnette, T. H. J. Exp. Zool. 58: 281–319 (1931).
4 Riley, G. M. Wilson Bull. 52: 73–86 (1940).

Nest-boxes, perches, litter, etc. were supplied. Males developed sperm, but females did not have ovarian development augmented beyond that previously reported. The further step of illumination of the roosts of unrestrained birds is at present impossible due to air-raid precautions.

(*c*) With the exception of Rowan,[1] investigators [1, 2, 3] have found that various portions of the visible light-spectrum are not equally effective in inducing sexual activation in the bird. While all investigators agree on the stimulating effects of red light, this agreement is lacking for green. Most of the above investigations were performed with low light-intensities and with rather broad bands of the spectrum. We are attempting a more refined analysis of this problem, using higher intensities and more restricted bands of light. We have already completed a number of experiments, but the data is not yet sufficient for publication.

BURGER, J. WENDELL, 1941. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 119–121.

—— 1942 (with BISSONNETTE, T. H., and DOOLITTLE, H. D.). Some effects of flashing light on testicular activation in the male starling (Sturnus vulgaris). Jour. Exp. Zool. 90: 73–82.

—— 1942. The influence of some external factors on the ovarian cycle of the female starling. Anat. Rec. 84. (In press.)

ROBERT K. ENDERS, Swarthmore College

Grants No. 121 (1936), $800 and No. 36—Johnson Fund (1941), $500. The mammals of the Chiriqui region of Panama with reference to their distribution, affinities, faunal relationships and life histories; to collect material for anatomical and embryological studies.

Ever since the publication of Bang's *Chiriqui Mammalia* (1902), the fauna of this region of Panama has been considered unique. This supposition was based upon the large number of new species recorded in this pioneer paper, and was supported by the fact that El Volcan de Chiriqui arose long after the formation of the Cordillera and was therefore isolated both geologically and geographically and that Chiriqui became extinct only recently (ca. 700 years). With these facts in mind a study of this unique fauna to determine its composition and origin was inaugurated in 1935. Studies in the life histories of the mammals were included in the

[1] Bissonnette, T. H. Physiol. Zool. 5: 92–123 (1932).
[2] Benoit, J. Bull. Soc. Sexologie 3: 438–455 (1936).
[3] Ringoen, A. R. Amer. Jour. Anat. 71: 99–116 (1942).

program as well as the collection of anatomical and embryological material. Three months were spent in the field in 1935 and seven months in 1937. In 1941 with the aid of grants from the American Philosophical Society and Swarthmore College and with the co-operation of the Academy of Natural Sciences of Philadelphia further studies were carried out over a period of three months. In previous years collections had been made on El Volcan de Chiriqui from an elevation of 3000 feet to the summit (11,525 feet) and on the Pacific slopes of the Cordillera from 3000 feet to 8500 feet. In 1941, with the aid of Peter Reed Morrison and H. Walter Jones, Jr., collections were made on El Volcan, to the summit of Copeta and on the Atlantic slope of the Cordillera from approximately 5000 feet to the summit of the divide.

The belief that this mammal fauna is unique arose from the lack of collections from the Atlantic slope of the Cordillera, where collecting is rather difficult, for preliminary study of these three extensive collections indicates that with the probable exception of a few species the fauna of the lofty and isolated Volcan de Chiriqui is similar to that of the more ancient mountain mass of the Cordillera. Although many of the species of mammals are common to both areas, the distribution and numbers show striking differences. These differences are not so much correlated with altitude as with rainfall, soil, vegetation, and possibly temperature. Since these factors appear to influence the distribution of the mammals more than geographical nearness, it is understandable why the fauna of the Atlantic slope of the Cordillera is in some ways rather more similar to that of the Volcan than that of the Pacific slope of the Cordillera which lies near to it.

The origin of this common fauna has not been traced. Possibly when all of the material is studied the origins may become clear, but more probably the understanding of these origins must wait until the highlands of eastern Costa Rica and central Panama are better known.

ENDERS, ROBERT K., 1936. Bassaricyon pauli, a New Species from Panama. Proc. Acad. Nat. Sci. Phil. V 88: 365–366.

—— 1938. Description of Heteromys desmarestianus chiriquensis. Proc. Acad. Nat. Sci. Phil. 90: 141–142.

—— 1939. Changes Observed in the Mammal Fauna of Barro Colorado Island, 1929–1937. Ecology 20: No. 1.

—— 1939. A New Rodent of the Genus Rheomys from Chiriqui. Proc. Acad. Nat. Sci. Phil. 90: 295–296.

—— 1939 (with PEARSON, O. P.). Three New Rodent Sub-species of Scotinomys from Chiriqui, Panama. Notulae Naturae 34: 1–4.
—— 1940. Observations on Sloths in Captivity at Higher Altitudes in the Tropics and in Pennsylvania. Jour. Mammal. V 21: 5–7.
—— 1940 (with PEARSON, O. P.). A New Sub-species of Reithrodontomys mexicanus from Panama with Remarks on Reithrodontomys mexicanus cherii. Notulae Naturae 60: 1–2.

WILLIAM K. GREGORY, American Museum of Natural History

Grant No. 577 (1941), $800. Bibliography of fishes.

During the first few months of the grant, the subject catalogue was reorganized, especially the physiological sections. Each title in the bibliography was studied and allocated according to my best judgment. Whenever necessary, the original article was consulted as an aid to assigning the title in the subject catalogue. The principal changes that were introduced into the subject catalogue were: the creation of a section on general physiology for titles dealing with such subjects as metabolism, osmosis, etc.; the bringing together of all the organ systems into a uniform arrangement; the creation of a section on physiology of sex; and considerable rearrangement of the ecology section. The subject catalogue is now considered to be in a satisfactory state as new titles can be filed with great rapidity and it is very seldom necessary to make new headings. A great many minor headings were discarded and the number of categories reduced from eight or ten, impractical for printing, to four. In the course of the work many new cross reference cards were made. The work on the subject catalogue is considered to be completed and in final shape.

As this work progressed, however, it became clear that the major task of the bibliography is the collection of additional titles. The bibliography purports to cover the literature on fishes from the closing date of the last published volume, namely 1914, through 1938. While the ideal, of including every title on fishes published during these years, can obviously never be realized, it is clear that the bibliography can be made much more complete than it is at present. In short, the amount of this work still to be done is much greater than supposed when I began to work on the bibliography. In the last six months, the work of collecting additional titles has therefore been pushed very vigorously and is at present in full progress. Whole files of abstract journals have been gone through

as well as extensive bibliographies in important books and summarizing articles. Wherever we have sought, new titles have been found, often many of them, and there has to date been no decrease in their number. Hence it is clear that much more of this type of work needs to be done before there can be any thought of publishing the material. Unfortunately only an experienced biologist with a knowledge of several foreign languages can carry on this work since only such a person can recognize the titles dealing with fishes. The assistant then compares these titles with the author catalogue and so titles that are lacking are picked up.

Some progress has been made on the process of a final editing of the titles. This means that each title has to be scrutinized once more for errors of spelling, journal and page references, etc., and marked for the printer in a uniform style. A uniform abbreviation for the names of journals is being worked out; this follows chiefly the abbreviations in the World List but in general the abbreviations adopted are less extensive, so as to avoid all possibility of error, confusion, and waste of time for the user of the bibliography.

This work has been conducted by Dr. Libbie Hyman of the Museum.

FRANK RALPH KILLE, Swarthmore College

Grant No. 396 (1940), $200. A study of the seasonal cycle of the gonad in the sea-cucumber (Holothuria parvula, Selenka) and the bearing of these data on the question of gonad regeneration within self-sterilized posterior halves.

The extreme variation in the reproductive system of large specimens of H. parvula was investigated by dissection and microscopic examination of 340 specimens from summer and winter collections. The species undergoes frequent transverse fission, which may be repeated without the intervention of the sexual process. The resulting posterior halves contain no part of the original reproductive system. All specimens which were obviously regenerating new anterior ends, were sterile yet none of the apparently whole animals was. In these and in the specimens regenerating new posterior ends, all stages in the typical development of the reproductive system occurred irrespective of the size of the animal. The simplest gonad consisted of nests of germ cells imbedded in the dorsal mesentery. Histological evidence indicates that they originated in

the hypertrophied left epithelium of the mesentery. No gonoduct was present in such animals. Discharge and resorption of mature tubules produces some variation in the reproductive system, but there is no extreme retrogression involving all tubules and the gonoduct. The possibility that the simple gonads in large specimens represent a retarded development brought about by the early onset of asexual reproduction was also eliminated. It is concluded that the nests of germ cells in large specimens are the early stages in the late regeneration of the reproductive system within a posterior fission half which has already reconstituted all other systems.

KILLE, FRANK RALPH, 1941. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1940: 199.

—— 1942. Regeneration of the Reproductive System Following Binary Fission in the Sea-Cucumber, Holothuria parvula (Selenka). Biol. Bull. 83: 55–66.

Grant No. 637 (1942), $200. Differentiation of the cells of the mesentery during regeneration of the digestive system in the sea-cucumber, Stichopus californicus (Simpson).

The inner epithelium of the regenerated digestive system in Stichopus regalis is said to arise by the differentiation of cells which occur throughout the length of the mesentery.[1] The conclusion rests upon a study of two specimens collected in nature. No comparable observations have been made on other genera. Since it is the strongest evidence for an alleged general totipotency of cells throughout the body of echinoderms, an investigation of a closely related genera has been undertaken to obtain additional data on the cellular basis for the regeneration of the gut.

Specimens of Parastichopus californicus (Stimpson) [2] were eviscerated by tearing the cloaca with toothed forceps and exerting pressure on the body-wall. All specimens lived in the aquaria until killed for examination and were in excellent condition. Fixation of the delicate tissues was obtained without damage by injecting Bouin's fluid directly into the body cavity.

Thus far, ten regenerating specimens have been studied microscopically and one seven-day regeneration has been examined histologically by means of serial sections. At this time, the edge of the

[1] Bertolini, F. Rigenerazione dell'apparato digerente nelle Stichopus regalis. Pub. Staz. Zool. Napoli 10: 439–447 (1930).

[2] Specimens were obtained through a grant by the American Academy of Arts and Sciences.

mesentery bears a fine, opaque, rod-like rudiment which varies considerably in size at different levels. Sections show that the two peritoneal epithelia of the mesentery have joined at the free-edge to form a continuous sheet. While the bulk of the cylindrical rudiment is due to a hypertrophy of the enclosed connective tissue, there is also a mass of small, deeply-staining cells along the side of the rudiment where the two epithelia have joined. These cells apparently take their origin from the epithelium and invade the connective tissue in large numbers. They are a constant feature of the entire mesentery except for a small part of the ventral mesentery. Their abundance and distribution indicate an important but at present unknown role in regeneration.

At fourteen days, there is still no macroscopic indication of respiratory trees, nor of a lumen in the primordium of the gut. At twenty-seven days, both are present. Histological preparations of these later stages are now being made.

Richard A. McLean and George Ayres Coventry,
Academy of Natural Sciences of Philadelphia

Grant No. 46. Johnson Fund (1942), $250. A study of the fishes and invertebrates of the southern Piedmont and coastal plains.

Alabama Studies.—The extensive collection of fishes, crustacea, reptiles, and amphibia from Alabama, represented by 113 species totalling 3,443 specimens, were taken around the headwaters of the Alabama and Tennessee Rivers.

The major portion of the fish collections were made in the Coosa River and its tributaries.

This year's work represents the most comprehensive faunal collection ever made in this region; adding several new species to those previously listed, besides many other rare and little known forms, making possible a more detailed study of the development, color, breeding, and local variations, peculiar to the fauna of this country. The work in this particular region is a continuation of our "Piedmont and Coastal Plain Survey," and is of great interest, due to the blending which occurs between the Southern Appalachian fauna and that of the Gulf Plains.

Thirty-two field stations were established at various strategic points, in active cooperation with the Alabama State Department of Conservation.

The entire trip covered approximately 3,200 miles in a period of two weeks. Accommodations and transportation for the party were arranged by Earl Daniels, of the Department of Conservation; G. Ayres Coventry, leader of the expedition, was accompanied by C. Bernard Peterson.

North Carolina Studies.—Extensive local collections of invertebrates and fishes were made in the vicinity of Beaufort, N. C. These are being used in comparative studies of the marine invertebrate faunas of the western Atlantic.

Beaufort was selected because it is very near to the critical region of Cape Hatteras where the tropical elements of the fauna largely disappear and previous collecting had shown that a large number of species was available there.

Accommodations for this party were provided by the Fish and Wildlife Service of this government through its Fishery Biological Station at Beaufort.

The results of both of these studies will appear in publications as part of the large scale survey of this region being conducted by the Academy of Natural Sciences of Philadelphia.

S. O. Mast, Johns Hopkins University

Grant No. 624 (1942), $500. Properties of the growth-substance produced by the flagellate Chilomonas paramecium.

Mast and Pace (1938) demonstrated that Chilomonas paramecium grown in a sterile solution of $NaC_2H_3O_2$, NH_4Cl, K_2HPO_4 and $MgSO_4$ in water produces a substance which in a concentration of approximately one part in 10,000,000 parts of fluid greatly accelerates reproduction and in concentrations of one part in 4,000,000 or higher retards it and causes death, and they showed that if this substance is subjected to 100° C. it is destroyed in 60 to 90 minutes.

In collaboration with Dr. D. M. Pace, observations were made on the diffusion of this substance (hereafter called growth-substance) through cellophane membranes. The size of the pores in the membranes used was calculated from the rate of passage of water through them under known pressure. By observations on the rate of reproduction of chilomonads in fresh culture solution in cellophane sacs suspended in culture fluid which contained growth-substance, it was found that this substance readily passes through membranes with

pores 6 to 8 mμ in diameter. This indicates that the substance consists of molecules which are much smaller than protein molecules.

Culture fluid which contained growth-substance was evaporated to dryness in a desiccator connected with a low temperature chamber in which the air pressure was reduced to 5 cm. Hg, then distilled water equal to the amount evaporated was added and the rate of reproduction of chilomonads in it measured. It was found that the growth-substance is not destroyed by drying, but that after it has been dried it disintegrates rapidly at room temperature, its effect being reduced nearly, if not quite, to zero in 24 hours. It was observed also that the growth-substance in the culture fluid disintegrates at room temperature but that it requires several weeks for its effect to become zero.

Numerous observations were made on the effect on the rate of reproduction of chilomonads, of substance extracted with ether from sterile chilomonad cultures in various stages of development. The results obtained demonstrate that the growth-substance is, at least to some extent, soluble in ether.

Mast, S. O., and Pace, D. M., 1938. The Effect of Substance Produced by Chilomonas paramecium on Rate of Reproduction. Physiol. Zool. 11: 359–382.

Paul Amos Moody, University of Vermont

Grant No. 563 (1941), $150. Serological investigation of speciation and evolution in genus Peromyscus.

The Libby photronreflectometer, for the purchase of which this grant was made, is an instrument which measures photoelectrically the turbidity of solutions. In the present investigation it is being utilized to measure the turbidity arising in the initial stages of the precipitin reaction prior to sedimentation. Use of the instrument makes possible exact measurement of the magnitude of the antigen-antibody reaction. By measuring the turbidities developed in each of a series of tubes containing constant concentration of antibody reacting with increasing dilutions of antigen, the entire course of the precipitin reaction can be measured, from the prozone (region of antigen excess) to the endpoint, at which concentration of the antigen is too slight to give rise to detectable reaction with the antibody. Thus the use of the instrument results in the obtaining of more complete data concerning the precipitin reaction than are ob-

tained by the usual ring (interfacial) test, which establishes merely an endpoint.

The photronreflectometer is being applied to serological study of rodent relationships, particularly of members of genus Peromyscus (whitefooted mice). Earlier work in this laboratory[1] showed the interfacial form of the precipitin test and the Schultz-Dale anaphylactic test unsatisfactory for the study of the relatively slight serological differences between the closely related forms comprising this genus. It was hoped that the photronreflectometer would make possible measurement of the small serological differences encountered. This expectation has been realized. Utilizing the instrument, serological differences between species in different subgenera, between species included in the same subgenus and even between species within the same species-group have been measured. Study of the serological relationship of genus Peromyscus to the closely allied genus Baiomys has been made also.

A preliminary report of the results obtained was presented at the twenty-fourth annual meeting of the American Society of Mammalogists (April 2, 1942). The studies are being continued and expanded to include both a greater number of species and a more complete analysis of the serological factors involved in the totality of differences between species. Results have not yet been published.

JEAN PIATT, University of Pennsylvania

Grant No. 488 (1940), $200. Transplantation of aneurogenic forelimbs in Amblystoma punctatum.

Normal peripheral nerve distribution is attained by virtue of the early and intimate contact between nerve and end organ anlage during embryonic development. This being the case, the question arises as to what would happen if the morphogenesis of a limb were made to occur prior to nerve outgrowth. What would be the distribution pattern of brachial plexus nerves which had grown into an aneurogenic limb whose development had been essentially completed and whose more distal tissues were now removed a relatively great distance from the invading nerves?

Operations were performed in three steps: (1) Extirpation of spinal cord segments 2–6 inclusive at stages 23–25; (2) parabiosis

[1] Levine, Harry P., and Moody, Paul A. Physiol. Zool. 12: 400–411 (1939); Moody, Paul A. Jour. Immunol. 39: 113–123 (1940).

of operated embryo with normal of same stage; (3) grafting of aneurogenic right forelimb of operated member of pair in place of corresponding limb of normal larva of same age, 10 to 14 days post-feeding. Grafted limbs were allowed to grow until the host animals were approaching metamorphosis.

Limbs were studied with regard to initiation and development of function, after which the animals were killed and the normalcy of the nerve pattern determined.

All limbs attained the power of completely individuated movement and each functioned in coordination with the contralateral host forelimb. This occurred in some cases as early as fifteen days following limb transplantation. Innervation of specific muscles was approximately normal; so-called normal innervation itself is subject to wide variation. The general nerve pattern was diagnostic of the typical punctatum forelimb and normal in most major particulars. Certain abnormalities occurred with greater frequency than others. On the basis of these experiments, it is concluded that normal peripheral nerve distribution can be implemented by factors other than those operative in early ontogeny.

Piatt, Jean, 1942. Transplantation of Aneurogenic Forelimbs in Amblystoma punctatum. Anat. Rec. 82: (Suppl.) 46.

—— 1942. Transplantation of Aneurogenic Forelimbs in Amblystoma punctatum. Proc. Physiol. Soc. Phila. 17: 17.

—— 1942. Transplantation of Aneurogenic Forelimbs in Amblystoma punctatum. Jour. Exp. Zool. 91: 79–101.

Carl Caskey Speidel, University of Virginia

Grant No. 410 (1940), $250. Investigation with the aid of ciné-photomicrography of the reaction of cells and tissues in living frog tadpoles as the animals are subjected to various experimental conditions.

Summaries of some of the previous results obtained in this field have been reported in the last three Year Books of the Society. During the past year work has been continued. Many new ciné-photomicrographs have been made. These include pictures, not only of nerve and muscle, the chief subjects of study, but also of epithelium, connective tissue, subepidermal cells with vacuolated processes, circulation, blood cells, endothelium of blood and lymph vessels, notochord, spinal cord, and special sensory cells. Repairs and adjustments of many sorts have been successfully recorded.

During the past few months the best ciné-photomicrographs have been assembled in seven new reels (each comprising about 400 feet of film). These have been fully edited with suitable descriptive titles inserted.

Two of the reels portray many varieties of nerve fiber adjustments (forty-three titles). Two other reels portray the finer details of cross-striation changes in muscle fibers during the stages of contraction and relaxation, during irritation and recovery, and during severe injury and repair (thirty-three titles). Another reel deals with the changes exhibited by epithelial cells and subepidermal vacuolated cells (nineteen titles); another shows the adjustments of blood and lymph vessels (twenty-five titles); and another gives an account of the relative parts played by lymph vessels and macrophages in the disposal of extravasated red blood cells in zones of hemorrhage (twenty-three titles).

SPEIDEL, C. C., 1940–42. Reports of Progress. Yr. Bk. Amer. Philos. Soc. for 1939: 292–294; for 1940: 251–252; for 1941: 142–143.

—— 1942. Adjustments of Nerve Endings. Bull. New York Acad. Med. 18: 625–653. (Harvey Lecture, reprinted by special arrangement. This paper appeared originally in 1941 in The Harvey Lectures, Series 36.)

—— 1942 (with JORDAN, H. E.). On the Constancy in Number of Sarcomeres within Individual Striated Muscle Fibers. Anat. Rec. 82: 470. (Abtract only.)

—— 1942. Myelin Sheath Adjustments. Anat. Rec. 82: 494. (Abstract only.) Motion picture film exhibited at the New York meeting of the American Association of Anatomists in April 1942.

H. RADCLYFFE ROBERTS, Academy of Natural Sciences of Philadelphia

Grant No. 47—Johnson Fund (1942), $250. Report on the studies of the phylogeny of a virtually unknown grasshopper which occurs in the spring in southeastern California.

Four weeks in April 1942 were spent in the field collecting Orthoptera which occur in the spring in the southern desert regions of California. The primary objective was to obtain males of an exceedingly rare species of grasshopper. This species was discovered over fifty years ago, and has been known only from a few females and a number of juveniles. Owing to its unusual form, its evolutionary relationship could not be determined without males. The importance of this investigation was to supplement my already

published studies of the evolutionary relationships of the families of the Acrididae.

About twenty-five males of this species were secured in the Death Valley and Mojave Desert regions, and were prepared for morphological and cytological studies. The dry specimens have been mounted and labeled by the Academy of Natural Sciences of Philadelphia and all material will be turned over to that institution.

Owing to my having joined the Military Service as entomologist since July 11, final study and publication is necessarily delayed until after the war. From preliminary observations, the species unexpectedly appears to be an unusual development of a tropical group of grasshoppers. Much other Orthoptera material was collected and placed in the Academy collections, but time was not available to report upon or appraise its value.

GENETICS

Edgar Anderson, Missouri Botanical Garden and Washington University, St. Louis

Grants No. 400 (1940), $900, and No. 516 (1941), $1,200. A cytological, taxonomic, and genetic monograph of the genus Tripsacum with reference to its allies Zea and Euchlaena.

The complexities of the genus Tripsacum described in the previous report made it advisable to publish a preliminary monograph of the genus (Cutler and Anderson, 1941). This now serves as a nucleus about which details of morphology, distribution, and cytology can be accumulated until it will eventually be possible to produce a really comprehensive monograph. For the present the collection of living plants of Tripsacum is being maintained at the Missouri Botanical Garden and in the greenhouses of Washington University, though this entails moving the Mexican and Texan specimens in and out of the greenhouse twice a year. Chromosome counts have been made on several plants and duplicates have been distributed to other botanists interested in the genus. The duplicate herbarium material collected in Mexico and Guatemala by Dr. Cutler has been donated to the major herbaria of this country.

Dr. Cutler's collections of Guatemalan and Mexican varieties of maize were grown at the Missouri Botanical Garden in the summer of 1941. Herbarium specimens of leaves and tassels, photographs of the ear, specimens of the seeds, and notes on internode

number, etc., have been combined to make a comprehensive permanent record of each collection. This special herbarium of varieties of Zea mays has been greatly augmented by collections from other regions contributed by various ethnologists, geographers, and agronomists. With this definitive material to draw on it has been possible to undertake a survey of Zea mays in its entirity. The first of a series of papers has been published (Anderson and Cutler) and others are in press or are in preparation.

CUTLER, HUGH C., AND ANDERSON, EDGAR, 1941. A Preliminary Survey of the Genus Tripsacum. Ann. Mo. Bot. Gard. 28: 249–269.

ANDERSON, EDGAR, AND CUTLER, HUGH C., 1942. Races of Zea mays: I. Their Recognition and Classification. Ann. Mo. Bot. Gard. 29: 69–88.

G(EORGE) W(ELLS) BEADLE, Stanford University

Grant No. 574 (1941), $1,200. Investigation of genes controlling known synthesis in the ascomycete Neurospora.

In collaboration with Doctors E. L. Tatum, N. H. Horowitz, and David Bonner and with the assistance of Miss Caryl L. Parker, Mrs. M. G. Hungate and others, a systematic search has been made for "biochemical" mutants in X-ray and ultraviolet treated material of the ascomycete Neurospora. The procedure followed has been described elsewhere.[1] In brief, this consists in growing single-spore cultures of irradiated material on so-called complete medium, on which mutants unable to synthesize such substances as vitamins and amino acids are able to grow by virtue of the presence of these materials in the medium. Loss by treated strains of the ability to carry out particular reactions is detected by transferring them to a "minimal" medium, that is, one meeting the minimal requirements of the wild type strain.

In accordance with this procedure, some 34,000 strains have been tested. Among these were several hundred morphologic mutants, many of which have been studied genetically, and some 120 biochemical mutants, that is, mutants unable to grow normally in the absence of added growth factors. The biochemical mutants include strains unable to synthesize the vitamins and growth factors thiamin, vitamin thiazole, pyridoxin, nicotinic acid, pantothenic acid, *para*-aminobenzoic acid, choline, adenine and uracil. Others

[1] Beadle, G. W., and Tatum, E. L. Genetic control of biochemical reactions in Neurospora. Proc. Nat'l Acad. Sci. 27: 499–506 (1941).

are unable to synthesize the amino acids arginine, leucine, lysine, methionine, proline, tryptophane, and valine. Two mutants show abnormal fat metabolism, another is unable to reduce nitrate nitrogen, and two are unable to synthesize the fat-soluble yellow pigments normally present in the conidia. There are many replicate mutants among the 120 so far obtained. Although the analyses are not complete, it can be said that at least 30 different biochemical reactions have been modified through gene mutations.

In general, mutants have been shown to differ from the normal strain by single genes and by the inability to carry out single syntheses. In some instances genetically different mutants characterized by inability to synthesize the same substance can be shown to be biochemically different. Thus two different strains unable to make nicotinic acid have different steps in the synthesis of this substance blocked.

Many of the biochemical mutants have been found useful in bioassaying for the specific substances that they require. For example, the mutant that cannot synthesize choline, responds quantitatively to choline in the medium. Technics for making such bioassays have been developed using either dry weight of the mycelia produced under standard conditions or rate of progression of a mycelial frontier on an agar surface. Since many of the substances for which mutants have been obtained are of importance in the nutrition of mammals, including man, the development of these technics should be of rather immediate practical importance. This is particularly true for the amino acid biossay technics, since rapid and reliable procedures are not now available for estimating the amounts of amino acids present in foodstuffs. With the large-scale substitutions of vegetable proteins for proteins of animal origins made necessary by war it is of the greatest importance to determine whether desirable dietary levels of essential amino acids are being maintained.

A number of mutants have been obtained which for normal growth require substances not yet identified with known vitamins or growth factors. Undoubtedly some of these will prove to require known substances either not yet tested or not supplied under proper conditions. On the other hand, it is probable that others will turn out to require as yet unknown growth factors.

These findings indicate in a striking way that genes are of vital significance in fundamental biochemical processes. They are, in

fact, essential and integral parts of the biochemical system in the same sense in which enzymes are. By making use of genes in controlling specific reactions the biochemist has available a powerful although as yet unexploited tool for the study of biosyntheses. On the other hand, by investigating the nature of reactions known to be under the immediate control of specific genes, the geneticist should be able to further elucidate the nature of genes and the ways in which they bring about their effects.

TATUM, E. L., 1942 (with BEADLE, G. W.). Genetic Control of Biochemical Reactions in Neurospora: An "Aminobenzoicless" Mutant. Proc. Nat'l Acad. Sci. 28: 234–243.

ALBERT F. BLAKESLEE, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor (now at Smith College)

Grant No. 628 (1942), $1,800. Determination of the factors involved in chemical regulation of embryo development in plants with possibility of their ultimate control.

During 1942 research was conducted along two main lines: *I.* Cultivation *in vitro* of proembryos. *II.* Chemical analysis of factors present in coconut milk which cause growth of Datura embryos *in vitro.* This phase of the investigations was carried out by Dr. J. Van Overbeek in coöperation with Dr. A. J. Haagen-Smit and Mr. Ralph Siu.

I. By the end of 1941 the smallest immature embryos which could be grown successfully were those in which the cotyledon primordia had just started to grow out at the time when they were isolated from the ovules. This was accomplished by the addition of coconut milk to the basic medium.[1]

During 1942 the culture of smaller and undifferentiated embryos (proembryos) succeeded by using in the medium sucrose instead of glucose and fractionated instead of untreated coconut milk. The presence or absence of coconut milk preparations (hereafter referred to as embryo factor) determined whether the undifferentiated proembryos developed into normal, differentiated

[1] van Overbeek, J., Conklin, Marie E., and Blakeslee, A. F. Factors in coconut milk essential for growth and development of very young Datura embryos. Science 94: 350–351 (1941). Cultivation in vitro of small Datura embryos. Amer. Jour. Bot. 29: 472–477 (1942).

embryos or into undifferentiated callus-like masses of tissues.[2] Proembryos smaller than 0.10 mm. in diameter at the time of isolation still resist cultivation *in vitro.* Attempts to cultivate the smallest type of proembryos are being continued.

II. The experimental evidence now available is far from complete, but indicates that the following substances in coconut milk are, at least potentially, capable of promoting the growth of Datura embryos *in vitro:* (*a*) sucrose, (*b*) mineral substances, and (*c*) organic substances other than sucrose.

(*a*) Of a large variety of pentoses, hexoses, and disaccharides tried, sucrose proved the most active. Although it is present in coconut milk, experiments indicate that only a small fraction of the activity of coconut milk is due to sucrose. There is no distinct optimal sucrose concentration for the embryo medium, concentrations between 2 and 7% being approximately equally effective, under the conditions of our experiments.

(*b*) Ash of coconut milk seems to have some growth promoting effect on the embryos. However, recognized micro-nutrient elements for higher plants (B, Zn, Cu, Mn, Mo) tried singly or in combination have failed so far to show any growth effect on the embryos. Investigations are in progress to determine the nature of the mineral constituents and the extent to which they account for the activity of coconut milk.

(*c*) A combination of sucrose and ash in amounts equal to those present in coconut milk could not replace the latter's activity, which is indicative of the presence of still other active substances, presumably organic. However, attempts to use embryos to test for the presence of these substances met with considerable difficulty. The embryo cultures were often irregular in their response to embryo factor preparations. This was due in part to the high sensitivity of the embryos to traces of heavy metals (Pb, Ba) which were introduced when chemical separations were made, and in part to insufficient knowledge of the conditions affecting embryo growth.

Two different ways were followed to remedy this situation: (1) A more detailed investigation of the various factors influencing the growth of embryos, such as embryo size, temperature, pH, and sensitivity to heavy metals. (2) Isolation of a Bacillus which, as far as we know at present, grows only in media containing the em-

[2] van Overbeek, J. Hormonal control of embryo and seedling. Cold Spring Harbor Symposia 10: 126–134 (1942).

bryo factor, but which is not sensitive to heavy metals, and which does not respond to the mineral components of coconut milk.

1. *Embryo Size.*—The relative increase in length of the embryos (final length/initial length) proved to be independent of the embryo size.[2] Hence it is a convenient and reliable measure for embryo growth.

Temperature.—There is a distinct optimal temperature around 32° C. Embryos are cultured at present at this temperature instead of at 25° C., as was previously employed.

pH.—Datura embryos cultivated in the 0.8% agar medium are very pH-sensitive. From pH 5, where the growth is practically zero, the curve rises steeply to pH 6. Between pH 6 and pH 7 a not clearly defined optimum is reached. Beyond pH 7 growth again declines. High buffer concentrations are not tolerated by the embryos. Mixtures of M/100 Na_2HPO_4 and KH_2PO_4 were found satisfactory (there was evidence that phosphate buffers containing K salts exclusively could not be tolerated). The original medium [1] had a pH of about 5.4, which corresponds to the pH of coconut milk. In view of the sharp rise of the pH curve between 5 and 6, pH 5.4 seems unsatisfactory for the bio-assay. The growth promoting effect of coconut milk preparations was found to be superimposed upon the pH effect. Investigations of the combined effects of pH, sucrose, mineral components, and embryo size are in progress.

2. Bacterial colonies were occasionally observed as infections in the embryo cultures. Since these occurred only in cultures which contained embryo factor preparations, the microorganism was isolated in the hope that it might serve as an additional test object for the embryo factor. The spore-forming Bacillus grows so rapidly at 32° C. and pH 7 that a test can be concluded 15 to 18 hours after inoculation (the turbidity is measured photometrically).

The bacillus responds to all extracts or fractions [3] containing embryo factor which have been tried, but it is neither affected by the mineral constituents of the coconut milk nor by the traces of heavy metals introduced in the course of chemical fractionation.

[3] For instance, when preparations containing embryo factor are shaken with ether, neither the bacillus nor the embryos respond to the ether-soluble fraction, but both respond to the water-soluble fraction. Of many organic solvents tried, only alcohol is a suitable solvent for embryo factor. For additional properties of embryo factor and the role of auxin in embryo growth see [2].

For these reasons and because the test is far less time-consuming than the embryo assay, it is hoped that the bacterial test can be utilized as a "pilot assay" to the more difficult embryo assay. It may considerably speed up the search for new source materials, the assaying of pure chemical substances [4] and the fractionation of embryo factor preparations.

VAN OVERBEEK, J. 1942. Hormonal Control of Embryo and Seedling. Cold Spring Harbor Symposia 10: 126–134.

BERNARD O. DODGE, New York Botanical Garden

Grant No. 609 (1942), $1,200. A study of the inheritance of the factors for heterocaryotic vigor in Neurospora tetrasperma.

An analysis of some 400 f_1 progeny races derived from a mating of races Yellow Dwarf 16 and tester race C_4 of Neurospora tetrasperma [1] indicated that a random selection of ascospores from a spore print is not at all satisfactory as a means for obtaining sufficient evidence for a solution of certain problems involved. It was suggested that race Dwarf 16 and race C_4 synthesize certain growth substances which are complementary so that, when nuclei from each of these races are brought together in a common cytoplasm, the resulting mycelium grows with greatly increased vigor and produces conidia in much greater abundance.

The occurrence of a rather large percentage of sterile double dwarfs among the 400 progeny analyzed also calls for an explanation. The fact that some races, which by all our ordinary tests were unisexual, grew with great vigor, seemed to indicate at first a cytoplasmic effect carried over through the hybrid asci. Another interpretation suggested was that there must have been fortuitous recombinations of the factors for growth substances, such that the complementary growth factors for heterocaryotic vigor are now being carried in single haploid nuclei rather than in separate haploid nuclei. However, races that seem to be unisexual by our ordinary tests might really be bisexual and heterocaryotic. They produce no ascocarps by themselves or when grown with tester races because of certain incompatibility factors. The increased individ-

[4] Among the nutrilites which have no embryo factor activity are: thiamin, pyridoxin, pantothenic acid, biotin, nicotinic acid, glycine, adenine, asparagine, ascorbic acid, succinic acid.

[1] Bull. Torrey Bot. Club 69: 75–91 (1942).

ual vigor shown by those races which seem to be unisexual might very well be merely masked *heterocaryotic vigor* and not either a cytoplasmic effect carried over or the result of fortuitous recombinations.

A satisfactory solution of these questions is only possible when one isolates four ascospores from individual asci, measures the growth rates of each such heterocaryotic mycelium and notes other morphological and genetical features. Then by a special plating technique one must separate each of the two nuclear components of each of the four heterocaryotic races so that all eight individual races from each ascus can be studied and compared with the four heterocaryotic races first isolated from that ascus. By this process it has been shown that certain races that appear at first to be *unisexual* by all our tests can be readily proved to be bisexual by isolating or separating their two different components mechanically. It has also been possible to separate the two components of Double Dwarf races as well as the components of Double Non-Dwarfs. The latter kinds often occur when two Double Dwarf races are obtained from a similar ascus. The other two are usually, or perhaps always, Double Non-Dwarfs.

It has been proved in this work beyond doubt that random selection of ascospores cannot be relied upon to furnish a satisfactory result. Neither would the mere isolation of the four spores from individual asci be sufficient, because of the likelihood of the presence of certain genetic factors which are so readily masked or their effects suppressed when the mycelium is heterocaryotic. It is only by the isolation of the eight individual unisexual component races from individual asci can an exact picture of the situation be secured.

With Neurospora tetrasperma it is possible to bring together two or more genetically different kinds of nuclei in the same cytoplasm and then separate them at will. This makes such species far superior to the eight spored species for a comparative study of that type of heterosis which may be referred to as heterocaryotic vigor. By analyzing the four heterocaryotic progeny from 131 asci and then isolating the eight unisexual components of 35 of these asci, it has been proved that the factors for heterocaryotic vigor are inherited for at least two generations. It has also been proved that fortuitous recombinations do occur such as to bring the complementary factors for heterocaryotic vigor into the indi-

vidual haploid nuclei. Whether these new combinations are the result of crossing-over in case of linked genes, or are due to a redistribution of chromosomes, has not been considered as yet.

Boris Ephrussi, Johns Hopkins University

Grant No. 586 (1941), $1,500. Studies of eye color differentiation in Drosophila.

Microscopic observation,[1] as well as solubility tests and gene substitutions [2] have shown that the normal (wild type) eye color of Drosophila is due to the presence of two pigments (red and brown). The brown pigment depends in its formation on a gene controlled hormone-like substance, which does not affect, under experimental conditions, the formation of the red pigment.[3] There are, however, indications that the two pigments are physiologically connected somewhere in the chain of reactions leading to their formation and one of the major purposes of the work reported here is to investigate this relationship.

I. A prerequisite for the planned investigations was the establishment of an adequate quantitative technique for the extraction and measurement of the pigments referred to. Starting from the observations of Tatum and Beadle [4] that the red pigment can be dissolved in acid ethyl alcohol and the brown pigment in acid methyl alcohol, a systematic study of pigment extracts and of the conditions of extraction and measurement has now led to the establishment of such a method.

The red pigment is extracted in 30 per cent ethyl alcohol acidified to $pH = 2.0$ with HCl. If the heads of the flies are separated from the bodies and cut into halves, the extraction is complete within less than 24 hrs. at 25° C. The extracted pigment is in a fully oxidized state and shows a maximum of absorption at 480 $m\mu$. Measurements at this wavelength are not affected by slight variations of the pH. The pigment solutions are unstable at ordinary temperature, but the loss is less than 1 per cent within 24 hrs.

The brown pigment is extracted from entire heads in absolute methyl alcohol containing 1 vol. per cent of HCl vapor. The extraction is complete within 24 hrs. and the solutions are stable.

[1] Johannsen, O. A. Jour. Morph. and Physiol. 39: 337–349 (1924).
[2] Mainx, F. Zeit. f. Ind. Abst. Vererb. 75: 256–276 (1938).
[3] Beadle, G. W., and Ephrussi, B. Genetics 21: 225–247 (1936).
[4] Personal communication.

The pigment is half-way oxidized and must be oxidized completely by H_2O_2. Solutions of oxidized pigment show an absorption maximum at 450 mμ which is independent of slight variations of acidity.

Both pigments, extracted as indicated, follow Beer's law within a wide range of concentrations (extinctions from 0.05 to 1.0). The relative concentrations can therefore be conveniently measured by photometric methods.

The outlined method is limited in its application to flies possessing only one of the pigments. Fractional (double) extractions are possible, but the slight solubility of the brown pigment in ethyl alcohol introduces a significant error.

II. The amount of pigment per eye is found to be a function of environmental conditions and of the age of the flies. Raised on a standard "enriched" medium, the flies give quite constant pigment concentrations. These values vary greatly with the temperature. The "age-change" for brown pigment is stabilized within 24 hrs., for red pigment after 4 days at 25° C.

If the flies are raised under standard conditions, samples of 30 heads give reproducible and homogeneous values.

III. Using these methods a study has been begun of the quantitative relationships of the two pigments in various eye color mutants. At this time four mutants of the so-called vermilion group (vermilion, cinnabar, scarlet and cardinal) have been examined and found to contain the full (identical with wild type) amount of red pigment. The brown pigment is totally absent in vermilion and cinnabar, and is present in traces in scarlet and cardinal.

The mutant white-blood is characterized by a strong reduction of both pigments. The degree of reduction depends on the temperature. Temperature changes affect the two pigments in quantitatively different ways.

IV. Kikkawa[1] has recently shown that there is a correlation between the presence in a given mutant of one of the "eye-color hormones" (cn^+ substance) and a positive diazo-reaction. The diazo-reaction has now been applied to different developmental stages of various eye color mutants. It is found that the course of formation of the cn^+ substance is profoundly affected by several gene substitutions.

[1] Kikkawa, H. Genetics 26: 587–607 (1941).

Norman H. Giles, Jr., Osborn Botanical Laboratory, and
Richard F. Humphreys, Sloane Physics
Laboratory, Yale University

Grant No. 649 (1942), $440. Comparative effects of x-rays and neutrons in inducing chromosomal rearrangements and mutations, primarily in Tradescantia; measurement of neutron dosages and intensity of neutron radiation.

Studies of the effects of neutrons in producing chromosomal aberrations, initiated with the Harvard cyclotron as a source of neutrons, have been continued, using the Yale cyclotron. Earlier results [1] indicating differences in the quantitative effects of equal total amounts of ionization in cells produced by X-rays and neutrons have been confirmed and extended.

For all types of aberrations induced in the developing microspores of Tradescantia, whether chromatid or chromosome effects, an approximately linear relation with increasing neutron dose was obtained with beryllium neutrons produced by 11 Mev deuterons at Harvard. This linear relation has been found to hold equally well for the less energetic beryllium neutrons produced by 4 Mev deuterons at Yale.

An analysis of the intensity factor indicates that, contrary to the situation with X-rays, there is no intensity effect with neutrons for the so-called exchange or two-hit types of aberrations. This point has been tested by both time-intensity and intermittent dosage experiments. The results strongly support the evidence from the dosage curves that exchange type aberrations are produced by single proton ionization paths.

Evidence has been obtained indicating a difference in the relative efficiencies of recoil protons of different energies in producing aberrations. For the production of both chromatid (terminal deletions and exchanges) and chromosome types, recoil protons of lower maximum energies (approximately 7.5 Mev, Yale) are more efficient than those of higher maximum energies (approximately 15 Mev, Harvard). The efficiency factor is of the order of 1.5 to 3, depending on the type of aberration, and apparently also on the stage in the nuclear cycle at which irradiation occurs. The factor has been determined by comparing equal total amounts of ionization pro-

[1] Giles, Norman. The effect of fast neutrons on the chromosomes of Tradescantia. Proc. Nat. Acad. Sci. 26: 567–575 (1940).

duced by the two types of protons as measured with the standard 100r Victoreen bakelite ionization chamber. Since ionizations are spaced at closer intervals along the shorter paths of the lower energy protons, the greater efficiency of the latter in producing aberrations indicates a positive correlation between ionization density and chromosome breakage. These results furnish independent evidence in support of the conclusion based on a comparison of X-ray and neutron irradiation, that more than one ionization is required to produce a primary chromosome break.

HERBERT S. JENNINGS, University of California at Los Angeles

Grant No. 503 (1940), $1,500. Genetic, behavioristic and cytological studies on "sex types" or "mating types" in Protozoa.

The work done has shown that in Paramecium bursaria there exist in place of the usual two sexes, individuals of several sex types or mating types. In certain varieties there are eight sex types; in others four, in others but two. By breeding together the different sex types, their inheritance has been followed; and a detailed study has been made of the self differentiation of a single clone into two sex types. Several papers have been published on the matters, and on the behavior shown in the relations of the sex types to each other. During the past year a detailed study has been made of the ageing of the clones, with its effect on mating and on mortality, also of the consequences of conjugation for the stock. This work is now being prepared for publication.

JENNINGS, HERBERT S., 1941. Genetics of Paramecium bursaria II. Self-differentiation and self-fertilization of clones. Proc. Amer. Philos. Soc. 55: 25–48.

—— 1941. Inheritance in Protozoa. *Protozoa in Biological Research.* Columbia University Press, N. Y., Chap. 15: 710–771.

—— 1941. The Beginnings of Social Behavior in Unicellular Organisms. Leidy Memorial Lecture, Univ. of Penna. Press, 17 pp. (Also in Science, vol. 92, pp. 539–546.)

—— 1941. The Transition from the Individual to the Social Level. Science 94: 447–453.

—— 1942. Genetics of Paramecium bursaria. III. Inheritance of mating type, in crosses and clonal self-fertilization. Genetics 27: 193–211.

—— 1942. Senescence and Death in Protozoa and Invertebrates. *Problems of Ageing.* (2d ed.) The Williams and Wilkins Co., Baltimore, Chap. 2: 29–48.

BOTANY

Harry Gregory Albaum, Brooklyn College

Grants No. 507 (1941), $300, and No. 605 (1942), $300. Detailed study of respiratory metabolism as related to plant growth.

1. The relationship between growth and metabolism in the oat seedling.

Avena seedlings grown in various concentrations of potassium iodoacetate, a glycolytic poison, are not inhibited in their growth (as measured by coleoptile elongation) during the early growth stages (up to about seventy-two hours). In addition up to this time neither the growth nor the respiration can be stimulated by potassium pyruvate and four carbon dicarboxylic acids like malic, fumaric and succinic acids. The respiration quotient during this interval is low (about 0.8).

The above results have been interpreted as signifying that sugar is probably not being metabolized to any considerable extent during these early growth stages. Measurements on the total ether soluble fraction point to the metabolism of fat. This kind of metabolism would explain the observations described above.

During the early stages the oxygen uptake as well as the growth can be inhibited by sodium azide. Beyond seventy-two hours, the inhibiting effect wears off. It is suggested that the effect of the azide is upon a cytochrome oxidase system which may cease to function in the older seedlings. That such a system operates earlier is also shown by the stimulation in oxygen uptake brought about in extracts of embryos in the presence of cytochrome c and p-phenylene diamine. This stimulating effect disappears at about the same time as the azide sensitivity.

The metabolism beyond seventy-two hours is probably one which utilizes sugar as the principal substrate. This is suggested by a sensitivity of the growth and metabolism to iodoacetate poisoning, stimulation by sugar intermediates (pyruvate and the dicarboxylic acids, including malonate and maleate), and a high respiration quotient which approaches unity with time. This is further substantiated by the observation that the fat disappearance has slowed down by the seventy-second hour and the reducing sugars begin to be utilized rapidly at about this time.

II. The relationship between nitrogen transport and metabolism in the oat seedling.

When the metabolism of the Avena seedling is poisoned by sodium azide, a respiratory poison, in the early stages and by potassium iodoacetate, a glycolytic poison, in the later growth stages, the movement of nitrogen from the endosperm into the embryo is blocked. It had been shown previously (see Part I) that the early metabolism (prior to seventy-two hours) is probably concerned chiefly with the utilization of fat which seems to be handled through a cytochrome oxidase system, while in the later metabolism sugar is the chief metabolite. In these later stages the respiration is azide insensitive but iodoacetate sensitive.

These poisons (azide and iodoacetate) have no effect on proteolysis in the endosperm and therefore cannot block nitrogen transport in this way.

That these poisons inhibit nitrogen transport by blocking the metabolism of the embryo itself has been demonstrated by experiments on isolated embryos in which asparagine is used as a nitrogen source and sucrose as a respiratory substrate. In such experiments azide inhibits early uptake (prior to seventy-two hours) while sugar and potassium iodoacetate have no effect. In the later stages sugar is necessary for nitrogen uptake, and the uptake can be poisoned with potassium iodoacetate. Just as in the case of growth inhibitions produced by iodoacetate, the inhibitory effect can be "reversed" with pyruvate.

The concentrations of iodoacetate required to produce inhibitions in nitrogen transport, however, are greater than those required for growth inhibition, suggesting that growth is more sensitive to iodoacetate poisoning than are other processes like nitrogen transport. This suggests that when only part of the glycolytic mechanism is inhibited by a poison like iodoacetate, those processes requiring most metabolite are influenced first; that is, the energy from the oxidation of sugar is used first for nitrogen transport; if any remains it may be utilized for "growth."

ALBAUM, HARRY G., 1942 (with DONNELLY, JOHN, and KORKES, SEYMOUR). The Growth and Metabolism of Oat Seedlings after Seed Exposure to Oxygen. Amer. Jour. Botany 29: 5, 388–395.

—— 1942 (with WORLEY, L. G.). The Development of Cytochrome Oxidase in the Chick Embryo. Jour. of Biol. Chem. 144: 3, 697–700.

VERNON I. CHEADLE, Rhode Island State College

Grant No. 442 (1940), $400. Investigations of the vascular system in the Monocotyledoneae.

1. Among the slide preparations previously made by virtue of this grant are materials of those members of the Monocotyledoneae characterized by secondary growth in diameter. In ten species of seven genera among the Liliaceae and Agavaceae this type of growth was clearly developed. In three species of the Bromeliaceae such thickening is not so clearly developed. These species supplement the number of plants in which the occurrence of secondary thickening has previously been reported by the author [1] and lends support to the conclusion that such secondary thickening is widespread in certain groups of the Monocotyledoneae. Detailed studies of these plants also indicate that the description of the general structure and development of such secondary tissues as previously reported is correct.

Early, and hitherto unseen, stages of adventitious root development as discovered in several plants demonstrate clearly the origin of these roots from the same generative zone which gives rise to the secondary tissues alluded to above. These preparations indicate also that new secondary bundles arising at the same time and in close proximity to the roots provide a large area through which water and dissolved substances move into the stem. These new tissues of the stem provide the chief pathway for movement of water up the stem through the younger (but mature) portion of the secondary tissues.

Another point of interest in such secondary tissue concerns the formation of growth rings. In some cases these rings are formed as yearly increments of growth and are therefore annual rings. The actual identification of these rings under the microscope is often difficult even when they appear to be macroscopically quite clear. Investigation of several specimens of the same species, each from various localities, has led to the conclusion that the microscopic variations responsible for the rings is not necessarily constant for each species. On the other hand, several instances were discovered where this constancy does seem to be maintained.

It should be emphasized that such secondary tissues are not and have not been considered by the author in his reported work (see

[1] Secondary growth by means of a thickening ring in certain monocotyledons. Bot. Gaz. 98: 535–555 (1937).

bibliography) on the general primary conductive system of the Monocots.

2. A paper now in press considers the origin of the vessel and certain features of its specialization in the Monocots. In that paper pitting was not considered because of the difficulty in interpreting the data accumulated. When all important features other than pitting are adequately treated, further effort will be made to analyze these data. However, it seems evident at present that the pitting in both tracheids and vessels is conditioned principally by the cells surrounding these elements. Because changes in neighboring cells seem to be a concomitant of vessel modification, especially in the shoot system, the problem of phylogenetic specialization in pitting is not easily solved. Nevertheless, the most primitive type of pitting in both tracheids and vessels seems to be scalariform. If this statement be correct, further specialization of pitting has probably occurred independently in tracheids and vessels. It follows that vessels have probably been derived from tracheids with pitting which is fundamentally scalariform in nature. Whether further study will substantiate these statements remains to be seen.

Cheadle, V. I., 1940 (with Whitford, N. B.). Notes on the Occurrence and General Structure of Sieve Tubes in the Monocotyledoneae. (Abstract.) Amer. Jour. Bot. 27 (Suppl.), No. 10.

—— 1941. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1940: 140–141.

—— 1941 (with Whitford, N. B.). Observations of the Phloem in the Monocotyledoneae. I. The occurrence and phylogenetic specialization in structure of the sieve tubes in the metaphloem. Amer. Jour. Bot. 28: 623–627.

—— 1941 (with Whitford, N. B.). A Discussion of Some Factors Which Influence the Form of the Vascular Bundle in the Monocotyledoneae. (Abstract.) Amer. Jour. Bot. (Suppl.), No. 10.

—— 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 149–152.

—— 1942. The Occurrence and Types of Vessels in the Various Organs of the Plant in the Monocotyledoneae. Amer. Jour. Bot. 29: 441–450.

John N. Couch, University of North Carolina

Grant No. 562 (1941), $1,000. Studies on lower fungi with particular reference to sex and nutrition.

The studies made possible by this grant consisted of several phases as follows.

In collaboration with Dr. Alma J. Whiffen, the work on the new species of Blastocladiella from soil collections from South Carolina and Texas has been completed and published. The most important contribution in this study was the discovery of a new type of sexual life cycle in this genus, one which parallels the life cycle of Allomyces cystogenus.

In addition, Dr. Whiffen has continued work on the nutrition of the chytrids, with particular reference to the effect of temperature on the decomposition of cellulose (filter paper) by Rhizophlyctis rosea, Strain 3. A temperature range of 21°–40° C. was employed. The amount of cellulose decomposed in a period of fourteen days increased with increase in temperature up to 28°–30° C. when the amount of cellulose decomposed decreased with further increase in temperature. At 37° C. almost no cellulose was decomposed and at 40° C. all growth of the chytrid ceased.

Two new genera and six new species of soil-inhabiting Phycomycetes have been described by Dr. Whiffen.

COUCH, J. N., 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 153–154.

—— 1942 (with WHIFFEN, ALMA J.). Observations on the Genus Blastocladiella. Amer. Jour. Bot. 29: 582–591.

WHIFFEN, ALMA J., 1942. A Discussion of Some Species of Olpidiopsis and Pseudolpidium. Amer. Jour. Bot. 29: 607–611.

—— 1942. Two New Chytrid Genera. Mycologia 34: 543–557.

—— 1943. Nowakowskiella delica n. sp. and Blastocladia parva n. sp. Jour. Elisha Mitchell Sci. Soc. 59. (In press.)

LADEMA MARY LANGDON, Goucher College

Grants No. 492 (1940), $400, and No. 638 (1942), $400. Studies in the comparative morphology and taxonomy of the Fagaceae.

The indehiscent 1-seeded fruit, 3–6 carpellate gynoecium, and the special cupular or 2–4 lobed involucre are distinctive of the Fagaceae, with considerable debate as to the nature of the involucre, —whether it is composed of the fused bracteoles of the little dichasium, or represents sterile scales of a condensed cone-like inflorescence, or is wholly new outgrowth of the subfloral axis.

Staminate inflorescences of members of the Fagacean series generally are distinguished by the absence of an involucre; the pistillate, on the other hand, by a cupular involucre in association with the florets, which forms in the Castaneae four spine-bearing valves

enclosing three nutlets, in the Fageae four bristly segments surrounding either two or three triangular nutlets, in the Pasanieae a scaly cup-like involucre partially enveloping each female floret of a two- or three-flowered cluster. Developmental studies in progress of the inflorescences of species of different genera of the Fagaceae, including Castanea, Castanopsis, Fagus, Nothofagus and Lithocarpus, have led to an interpretation of inflorescence and cupule relationship as follows: (1) the assumption of a common origin both of the staminate and the pistillate inflorescences of the Cupuliferae from an ancestral several-flowered cymose type possessing both tertiary and quarternary floral units, as in the staminate inflorescences of many existing Fagaceae; the individual florets of this hypothetical cymule probably hermaphroditic, with a 3-6 carpellate gynoecium; (2) the early evolution of either a cupulate or a segmented type of involucre as the product of reduction and general modification of sections of the original more complex cymule, including the axial portions of this inflorescence.

The striking resemblance to the gland-bearing husk enveloping seeds of the Lagenostomales seen in the curiously gland-adorned segments of involucres encasing the female florets and nutlets of certain species of Nothofagus, has previously been commented upon.

Langdon, LaDema Mary, 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 158–159.

John Ernst Weaver, University of Nebraska

Grants No. 283 (1938), $450, No. 380 (1939), $600, No. 489 (1940), $600, and No. 596 (1941), $300. Condition of midwestern grasslands at the end of the drought, and nature and rate of recovery.

The resurvey of midwestern grasslands both above and below ground at the end of the great drought (1940) has been completed. This study was made in collaboration with Dr. F. W. Albertson. The area included the western portion of the true prairie in Iowa, eastern Nebraska and Kansas, and the mixed prairie, with its short-grass plains disclimax, in western Kansas and Colorado. There was little damage to native vegetation east of the Missouri river. Elsewhere in true prairie little bluestem (Andropogon scoparius), which was formerly the most abundant grass, suffered the greatest loss. It entirely disappeared from many prairies, and was reduced from about 55 per cent basal cover to 5 per cent elsewhere. Big bluestem (Andropogon furcatus), ranking second in importance,

after heavy initial losses, persisted or spread widely. Its percentage relation to the total remaining but often sparse cover was about the same as formerly. Bluegrass (Poa pratensis), formerly widely and uniformly scattered throughout, almost all died. Needle grass (Stipa spartea), formerly fourth in abundance in uplands, withstood the drought well, and it spread into bared or semibared areas regardless of slope, and even on to low ground. The most important grasses before the drought and at its close are listed; the species in each group are arranged in sequence of decreasing abundance.

Little bluestem (Andropogon scoparius)	Western wheat grass (Agropyron smithii)
Big bluestem (Andropogon furcatus)	Side-oats grama (Bouteloua curtipendula)
Bluegrass (Poa pratensis)	Big bluestem (Andropogon furcatus)
Needle grass (Stipa spartea)	Needle grass (Stipa spartea)
Prairie dropseed (Sporobolus heterolepis)	Blue grama (Bouteloua gracilis)

The first two grasses in the second list are very xeric. They initially composed less than one per cent of the cover, but like the dryland short grass, blue grama, they increased enormously during drought. Western wheat grass often occurs in nearly pure stands over thousands of acres.

Grazing had reduced most of the mixed prairie to a short-grass disclimax. Mid and tall grasses were confined mostly to rocky slopes or ravines. Blue grama and buffalo grass (Buchloe dactyloides) formerly constituted four-fifths of the entire vegetation of the short-grass type. Intermixed with the short-grass cover were many species of less xeric grasses and forbs which practically all died during the drought. Extreme drought and burial by dust also killed most of the short grasses. In contrast to the losses of short grasses, gains were made by blue grama spreading on hillsides and into ravines and even on to lowlands where mid grasses had succumbed. Buffalo grass formerly shared the short-grass area more or less equally with blue grama. It was heavily damaged nearly everywhere and in many places it entirely disappeared. Despite rapid and repeated local recovery, this species lost much more heavily than the more stable blue grama. The much depleted short-grass cover at the end of the drought (1940) consisted almost

entirely of these two species, but buffalo grass constituted only about one-third as much of the mixture as blue grama.

Grasses and forbs in true prairie died from desiccation in 1934–1936 only after they had absorbed the available water in the surface 3 or 4 feet of soil. Rainfall during the dry years was inadequate to moisten the deeper portion of this dry layer. Roots of new vegetation were confined to that portion of the soil moistened by current precipitation, and they were separated by a dry layer from the deep moist subsoil. Certain forbs with roots which had penetrated to depths of 10 to 17 feet before the drought survived, although greatly dwarfed. They obtained water in part from a slightly moist subsoil which had not received additional moisture since 1934. In mixed prairie, bisects in the short-grass type revealed that roots of blue grama and buffalo grass were profoundly reduced in numbers and in depths of penetration. The former depth was 3 to 5 feet; this had been replaced by one of 1 to 1.5 feet.

Loss of the plant cover greatly hindered water infiltration as did also the covering of dust and the invasion of Agropyron smithii. The period necessary for an inch of water to infiltrate into bare soil was 2.8 times as long as that for infiltration into the same kind of soil which supported a good cover of pre-drought prairie grasses.

Amount of available soil moisture and yield of native grasses and forbs were ascertained at four groups of stations in true and mixed prairie during the dry year 1940, and the moderately wet one 1941. Yields from Iowa to west-central Kansas in 1940 were 1.45, .80, .56, and .17 tons per acre, respectively. These increased, in the same sequence, the next year to 2.43, 1.85, 2.53 (wheat grass), and .65 tons. Yield from the west-central Kansas stations was mostly weeds, a ton per acre being produced in 1941.

Two growing seasons with good rainfall following the prolonged drought have resulted in marked recovery of the native vegetation. The subsere in partially denuded areas, as well as that in bared soil, is under observation and the nature and rate of recovery is being determined by means of scores of permanent quadrats. A new cover of native vegetation, 50 to 80 per cent as dense as the old one but of very different composition, has developed in the most favored areas.

WEAVER, J. E., 1940–41. Reports of Progress. Yr. Bk. Amer. Philos. Soc. for 1939: 303–305; for 1940: 269–271; for 1941: 165–168.

—— 1940 (with Albertson, F. W.). Deterioration of Grassland from Stability to Denudation with Decrease in Soil Moisture. Bot. Gaz. 101: 598–624.
—— 1940 (with Albertson, F. W.). Deterioration of Midwestern Ranges. Ecology 21: 216–236.
—— 1940 (with Robertson, J. H., and Fowler, R. L.). Changes in True-Prairie Vegetation during Drought as Determined by List Quadrats. Ecology 21: 357–362.
—— 1942. Competition of Western Wheat Grass with Relict Vegetation of Prairie. Amer. Jour. Bot. 29: 366–372.
—— 1942 (with Albertson, F. W.). History of the Native Vegetation of Western Kansas during Seven Years of Continuous Drought. Ecological Mono. 12: 23–51.
—— 1942 (with Mueller, I. M.). Role of Seedlings in Recovery of Midwestern Ranges from Drought. Ecology 23: 275–294.
—— 1943 (with Albertson, F. W.). Resurvey of Grasses, Forbs, and Underground Plant Parts at the End of the Great Drought. Ecological Mono. 13: 63–117.

Edgar T. Wherry, University of Pennsylvania

Grant No. 403 (1940), $500. Preparation of a monograph on the genus Phlox.

Research on the genus has been continued during the year. In Arizona eleven species have been recognized to occur, three of them endemic. In Nevada, sixteen have been recorded, two of them new to science. Nomenclatorial-taxonomic studies have also been made of other genera of the family Polemoniaceae.

Wherry, Edgar T., 1942. The Genus Polemonium in America. Amer. Midl. Nat. 27: 741–760.
—— 1942. Phlox, in Flowering Plants and Ferns of Arizona, by Kearney and Peebles, U. S. Dept. Agr. Misc. Publ. 423: 712–716.
—— 1942. The Phloxes of Nevada. Notulae Naturae, Acad. Nat. Sci. Phila. No. 113: 1–11.
—— 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 168–169.

PSYCHOLOGY

Livingston Welch, Hunter College

Grant No. 490 (1940), $500. An experimental study of the genetic development of the ability to reason in connection with concepts of varying degrees of abstractness.

Two paper and pencil tests of inductive reasoning were administered to children varying in age from 8 to 15 years. The Composite Test of Inductive Reasoning was given to 111 children and

the Joint Method Test of Inductive Reasoning was given to another group of 113 children.

The two tests were graded in difficulty. The Composite Test involved a variety of inductive problems ranging from an elementary type of association to situations covered by Mill's Joint Method of Agreement and Difference. The Joint Method Test began with the Joint Method situation.

The difficulty was increased by making changes of a quantitative and qualitative type. Quantitative changes refer to increases in the number of antecedents or in the number of rows, and to a variation of the proportion of positive and negative instances in a problem. Qualitative changes refer to shifts in the abstractness of the concepts that were employed in the reasoning situations. In some instances the concepts were at the object level, whereas in others the concepts were at the first or second hierarchy level.

The quantitative changes introduced in the Composite Test were so elementary that performance was not noticeably affected. When the qualitative changes were superimposed upon the quantitative, a definite drop in the scores occurred.

The results of the Joint Method Test show clearly that both types of change will cause a decrease in score. The decrement produced by increasing the abstractness of the concepts was greater than that produced by increasing the number of antecedents, but the difference was not great enough to meet the criterion of being statistically reliable.

This research was carried out in collaboration with Dr. Louis Long in our Institute for Research in Child Psychology.

WELCH, LIVINGSTON, 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 172–174.

—— 1942 (with LONG, LOUIS). Influences of Levels of Abstractness on Reasoning Ability. Jour. Psych. 13: 41–59.

—— 1942 (with LONG, LOUIS). Factors Affecting Efficiency of Inductive Reasoning. Jour. of Exper. Education 10: 252–264.

S. C. BROOKS, University of California

Grants No. 376 (1939), $600, and No. 581 (1941), $400. Continuation of investigations of the intake and exit of ions in living cells, particularly Nitella, Paramecium and eggs of marine invertebrates.

The identity of the basic substances given off by Paramecium caudatum was studied during the absorption of alkali metal cations,

and especially in connection with growth and the attendant primary accumulation of salts. So far only ammonia was studied. The attempt was made to stimulate growth of the collected and washed paramecia by furnishing glycine. In experiments lasting up to forty-three hours there was no evidence of any difference between the dry weights of paramecia suspended in double distilled water, 0.01% KCl or 0.01% KCl + 0.1% glycine in two similar experiments. It appears that sufficient reserves were present in the paramecia to make the addition of glycine unimportant.

Assuming that paramecia suspended in water take in or lose no K^+, it is shown that K^+ ions were taken in by paramecia in KCl or KCl + glycine at subequal rates, 0.62 vs. 0.61, or decreased by glycine, 0.17 vs. 0.053 all $\times 10^{-14}$ M cm.$^{-2}$ sec.$^{-1}$ (M cm.$^{-3}$ cm.$^{-1}$)$^{-1}$. The first term refers to the moles of the ions taken by cells whose area was the second term; the time the third term; and the last term the concentration in M cm.$^{-3}$ across the plasma whose thickness in cm. was arbitrarily taken as 10^{-6} cm. This permeability reduces to cm.^{2} sec.$^{-1}$. These permeability constants were obtained after 24 or 43 hours; earlier in these experiments (0.2–0.75 hours) values of 2.21–5.52 or a still higher aberrant value of 27.6×10^{-14}. The assumption of an exponential penetration (progressive decrease in concentration gradient) is inadequate to explain this decrease in the permeability constants calculated after experimental durations. Taken in connection with work with single cells, this suggests that the relatively low figures given here cannot be the result of single simple penetration, but rather are a result of successive gains and losses of K^+. Experiments designed to give figures on the ammonia production during the earlier periods, e.g. up to one hour, are impracticable because of the lack of methods for titrating such small amounts of ammonia.

In the longer experiments it was observed that the addition of glycine led to a significantly increased production of NH_3-nitrogen; even KCl alone increased it slightly. The important feature was that glycine failed to increase K^+ intake in proportion to NH_3-nitrogen output. The K^+ intake formed 2.3% of the NH_3-nitrogen output for paramecia in water, 2.2% when in KCl + glycine, at 5.8% when in KCl only.

When ammonia is produced in cytoplasm whose pH is about 6.9, much of it would form partially ionized salts, and about 99.6% of NH_3-nitrogen, other than the unionized salts, will be in the free

NH_4^+. Some of the NH_4^+ formed may have left the cell by ion exchange, for K^+ in this case. Some may leave by the passage of undissociated ammonium salts, and some in the form of the ammonia molecule. The relative abundance of these diverse paths of ammonia and its salts in leaving the cell awaits quantitative determination of their rates of loss.

It is clear that (1) ammonia is a principal waste of Paramecium caudatum, and it is increased by the provision of glycine; (2) the intake of K^+ by ionic exchange is made probable by the ample supply of NH_4^+.

BROOKS, S. C., 1939. Report of Progress. Yr. Bk. Amer. Philos. Soc. 1940: 126.

PHYSIOLOGY AND PATHOLOGY

DEAN A. COLLINS, Temple University School of Medicine

Grant No. 417 (1940), $250. Experimental renal hypertension: Studies on the elevation of blood pressure resulting from the restoration of renal circulation after periods of complete interruption.

These studies were made since it seemed likely that the humoral mechanism involved in experimental renal hypertension has a physiological role. The following results indicate that when arterial blood pressure is lowered by hemorrhage or by histamine the kidney liberates pressor material, which acts as a homeostatic factor:

1. The pressor activity of blood from anesthetized donor dogs was studied by determining the change in blood pressure resulting from injection of the blood (usually 42 cc.) into a nephrectomized recipient animal. Control samples did not possess significant pressor activity. Samples taken about one hour following hemorrhage (34 to 45 cc. per kgm. of body weight) invariably gave pressor responses (9 to 40 mm. Hg). Many of the responses were renin-like, and persisted 10 to 30 minutes. Others had a duration approaching that of reactions to angiotonin. Similar results were obtained after the blood pressure had been maintained at 30 to 60 mm. Hg by histamine. Two findings following hypotension demonstrated that the kidney was responsible for the appearance of pressor activity in blood: (1) responses from renal venous blood were usually greater than those from corresponding arterial blood; (2) pressor activity developed in the blood of adrenalectomized

dogs, but not in that of animals from which both kidneys and adrenal glands had been removed.

2. Animals without renal circulation were unable to maintain their blood pressures in hemorrhage as effectively as dogs subjected to corresponding control procedures. Since the loss of other known renal functions does not explain the deficiency in the former animals, it is presumably due to the loss of the renal humoral mechanism.

3. After about 1¾ hours of extreme hypotension due to hemorrhage, nephrectomized dogs gave a slightly increased average response to injected renin (supplied by Dr. Irvine H. Page), while intact animals showed absent or feeble reactions. These findings are difficult to interpret. They suggest, however, that the kidneys may liberate enough renin to cause tachyphylaxis and thus disable their own compensatory mechanism. After less severe hypotension no tachyphylaxis to renin was observed.

COLLINS, D. A., 1940. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1940: 146–147.

—— 1941 (with HAMILTON, A. S.). Role of the Kidney in the Maintenance of Arterial Blood Pressure in Hemorrhage. Amer. Jour. Med. Sc. 202: 914.

—— 1942 (with HAMILTON, A. S.). Role of a Renal Humoral Mechanism in Hemorrhage. Federation Proc. 1: 16.

—— 1942 (with HAMILTON, A. S.). Role of a Renal Humoral Mechanism in Shock. Federation Proc. 1: 35–36.

—— 1942 (with HAMILTON, A. S.). The Homeostatic Role of a Renal Humoral Mechanism in Hemorrhage and Shock. Amer. Jour. Physiol. 136: 275–284.

FREDERICK RONALD HAYES, Dalhousie University

Grant No. 583 (1941), $500. The inorganic metabolism of developing salmon eggs.

During the winter of 1941–42 Mr. Douglas Darcy, Miss Charlotte Sullivan and the writer began to work up methods and conduct analyses of the following ions in the yolk sacs and embryos of developing salmon: chloride, phosphate, sulphate, potassium, calcium, sodium, magnesium, and carbonate. The quantities of some of these ions in milligrams per 130 mg. egg are as follows: K, 0.37; Ca, 0.10; Na, 0.02; Cl, 0.18; total P, 0.60; inorganic P, 0.18; organic P, 0.42; phosphocreatine P, 0.02. On the other ions there are as

yet no results sufficiently reliable to quote. Up to the present there is no evidence of loss of ions to the outside, or uptake from the surrounding water; thus the larva appears to be a closed system. There is a selective action exercised by the embryo in taking ions from the yolk. For example, as development proceeds potassium comes to be predominantly in the embryo, while most of the calcium is left behind in the yolk sac. The values obtained, however, are not yet numerous enough to warrant statements about other trends which have been noticed.

LAURENCE IRVING, Swarthmore College

Grant No. 593 (1941), $400. **Investigation of the effect of temperature upon the respiratory exchange of fish.**

The oxygen consumption of cunners, Tautogolabrus adspersus Walbaum, has been determined over the range of endurable temperatures in winter and in summer. In winter the metabolism was slightly greater at temperatures below 15° C. than in summer. The lethal temperatures in summer were above 30° C. and below 5° C. In winter, they were above 26° C., and steady metabolism continued at 0.6° C. There is a slight increase in the winter rate of metabolism which might counteract the depressant influence of low temperature. The acclimatization is small, and the winter metabolism at 5° C. was about one-fourth the summer rate at 20° C. Cunners disappear from the waters along shore in winter, and it seems likely that their metabolic rate is too slow in winter for maintenance in their normal summer habitat.

JAMES HAIN LEATHEM, Rutgers University

Grant No. 639 (1942), $400. **Studies on the influence of gonadotropic and androgenic hormones on the reproductive organs of normal and hypophysectomized rats.**

The effect of dosage of equine gonadotropin (pregnant mare serum) on the hypophysectomized immature rat testis shows that increased dosage causes an increased stimulation of the interstitial tissue but the response is not a proportionality. These results on eighty-five rats in comparison with results on sixty hypophysectomized female rats indicate that the potential luteinizing effect of

the dose administered is not observed in the female and thus is determined by the end organ response.

The normal immature male rat is more responsive than the hypophysectomized immature male rat to the same dose of equine gonadotropin and the accessory reproductive organs of the normal rat reach a maximum weight with a lower total dosage of gonadotropin.

Investigations concerning the mode of administration show that equine gonadotropin administered intraperitoneally in five injections at daily intervals is the most effective manner of administration of this hormone in reference to the stimulation of the accessory reproductive organs of both normal and hypophysectomized immature male rats. Administration of the same total dosage (*a*) subcutaneously in equally divided doses once daily for five days, (*b*) subcutaneously, (*c*) intraperitoneally in a single injection was one hundred per cent less effective in their stimulating ability in all cases. A marked increase in size of the seminal vesicles of hypophysectomized rats treated with equine gonadotropin was observed frequently without a similar stimulation of the prostate which is contrary to the action of gonadotropins from the anterior pituitary.

A group of 210 normal immature female rats were used to determine the influence of testosterone propionate pretreatment on the response of the ovary to either chorionic gonadotropin, equine gonadotropin or rat anterior pituitary extract. It has been found that a single subcutaneous injection of one milligram of the androgen will augment the ability of chorionic gonadotropin to increase ovarian weight if the gonadotropin is administered in essentially maximally effective dosages. Similar, but less decisive, results were obtained with anterior pituitary extract whereas small dosages of equine gonadotropin were suggestively inhibited and larger dosages were definitely inhibited by the pretreatment with testosterone propionate. These effects are more clearly apparent when a twenty-seven-day old rat is used in place of a twenty-two-day old animal. This action of testosterone propionate, in altering the action of gonadotropins, presumably by its effect on the pituitary, illustrates another difference between chorionic gonadotropin and equine gonadotropin.

ROBERT F. PITTS, Cornell University Medical College
(Now at Cornell University)

Grant No. 585 (1941), $300. A functional and anatomical study of central nervous mechanisms controlling the respiratory and cardiovascular systems.

The rhythmic sequence of inspiration and expiration results from maintained tonic activity of the bulbar respiratory center interrupted by the activity of two inhibitory systems: (1) the vagal (stretch receptor) inhibitory system; (2) the brain stem (pneumotaxic) inhibitory system (Marckwald, Lumsden, Stella, etc.). A study has been made of the pattern of activity of single phrenic motor neurones and the nature of their response to chemical stimulation of the respiratory center as affected by the elimination of these two inhibitory systems, singly and together.

Action potentials of single neurones dissected from the phrenic nerve of the cat were amplified and recorded along with a record of inspiratory volume. The brain stem inhibitory system was eliminated by transecting the brain at the level of the caudal pons. The vagal reflex inhibitory system was eliminated by bilateral section of the vagus nerves. Chemical stimulation of respiration was effected by increasing the carbon dioxide content of the inspired gas.

Phrenic motor neurones show a characteristic pattern of activity in the intact animal; namely, a slow augmentation of frequency of discharge with the onset of inspiration, and a sudden decrement as expiration begins. With an increase in the chemical stimulus to breathe, both the frequency of discharge of the individual units and the number of units active, increase.

If the vagal inhibitory system alone is eliminated, there results a slowing of respiration and a prolongation of the inspiratory phase of activity. However, the pattern of phrenic neurone discharge remains unaltered. An increase in carbon dioxide in the inspired gas leads to an increase in frequency of discharge of those neurones active, and to recruitment of additional neurones, much as in the normal. Elimination of the brain stem inhibitory system alone, results in even less disturbance in rate, pattern and response to chemical stimulation. However, if both systems are eliminated, rhythmic respiration is replaced by maintained inspiration. Phrenic neurone discharge becomes continuous, at a frequency

which increases as carbon dioxide accumulates within the body. Additional units are recruited, and eventually maximal inspiratory activity results. Discharge then becomes irregular and the animal dies. If prior to this, the central end of one vagus nerve is stimulated with brief bursts of high frequency shocks at appropriate intervals, the maintained inspiratory phrenic neurone discharge may be periodically inhibited and converted into rhythmic respiration. The discharge now shows slow augmentation and rapid decrease in frequency characteristic of the normal pattern.

It follows then that the inspiratory center-motor neurone system regulates depth of respiration by controlling motor unit impulse frequency and number of active units. The activity of this system in isolation is continuous and graded in degree in relation to carbon dioxide tension of the blood. The vagal inhibitory and brain stem inhibitory systems serve in parallel manner to inhibit periodically the activities of the respiratory center-motor neurone system. Such periodic inhibition leads to rhythmic respiration and provides the groundwork for variations in rate.

Work in progress is directed toward an analysis of excitability changes within the respiratory center-phrenic neurone system. It is hoped that this work will lead to an understanding of the repetitive discharge characteristic of the system.

PITTS, R. F., 1942. The Functions of Components of the Respiratory Complex. J. Neurophysiology 5: 403–413.

HERBERT SHAPIRO, Vassar College
(Now at Massachusetts Institute of Technology)

Grant No. 440 (1940), $600. Studies on the physiology of development.

The study on the kinetics of elongation and return, and division of cells, and the effects of ions on these processes has been completed.

The velocity of formation of the fertilization membrane was investigated over the temperature range 9.5° C. to 28.6° C. and found to increase exponentially with rise of temperature. This process was shown to be due to an intrinsic dependence of the rate of membrane formation upon temperature, as control experiments eliminated the possible complicating effect of extracellular jelly coatings.

A partial analysis has been carried out, in collaboration with Dr. Hugh Davson, of the potassium ion content of the Arbacia egg, in

both the resting and activated states. These cells contain approximately twenty times as much potassium as sea water, and lose, in different lots of cells, from 1.5 to 8 per cent over a period of two hours. Cells placed in artificial sea water with five times the normal potassium content accumulated potassium against a gradient. Fertilized eggs in artificial sea water of high calcium content lost potassium more rapidly than those in normal sea water. When replaced into normal sea water, such cells begin to regain their potassium, the ion diffusing in against a gradient.

The pigment echinochrome, present in sea urchin eggs, was found to be retained by the cell in the resting state, but to be liberated from the granules to which it is bound, and diffuse outside the egg after fertilization. Alterations of the ionic content of the medium did not prevent this retention in the unfertilized egg, or its liberation in the fertilized egg.

In continuation of studies on mammalian parthenogenesis previously reported,[1, 2] attempts were made to activate tubal eggs in unoperated rabbits by anesthetizing the animal, and lowering the body temperature to points as low as 18° C., normal body temperature in the rabbit being about 39.7° C. Animals recovered perfectly from such body cooling. In one doe, eggs in two cell stage were found, and in another, an early morula.

SHAPIRO, HERBERT, 1940. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1940: 246–248.

—— 1941. Centrifugal Elongation of Cells, and Some Conditions Governing the Return to Sphericity, and Cleavage Time. Jour. Cell. and Comp. Physiol. 18: 61–78.

—— 1941 (with DAVSON, HUGH). Permeability of the Arbacia Egg to Potassium. Biol. Bull. 81: 295–296.

—— 1941. The Parthenogenetic Activation of Rabbit Eggs in the Unoperated Animal. Science 94: 551–552.

—— 1941. The Speed of Membrane Formation. Proc. Am. Soc. Zool., Anat. Rec. Suppl. 81: 75.

VALY MENKIN, Harvard Medical School

Grant No. 6—Daland Fund (1941), $600. Basic mechanisms of cellular injury particularly as manifested in diabetes with superimposed inflammation.

1. Cellular Injury and Gluconeogenesis as Manifested in Inflammation and Diabetes.

[1] Pincus, G., and Shapiro, H. Proc. Nat. Acad. Sci. 26: 163 (1940).
[2] Pincus, G., and Shapiro, H. Proc. Amer. Philos. Soc. 83: 631 (1940).

An acute inflammation in a depancreatized dog is accompanied by a marked degree of local gluconeogenesis. The surplus glucose formed in the inflamed area from products of local protein breakdown diffuses into the circulation, enhancing thus the existing state of hyperglycemia. The concentration of exudate sugar is at a consistently higher level than the blood sugar from the very beginning of the inflammatory reaction. When the inflammation has progressed for about one day, the concentration of blood sugar tends to approach that of the exudate sugar. The establishment of a concentration gradient between the level of exudate and blood sugar strongly supports the view of a gluconeogenetic process at the site of inflammation.

A similar gradient, though not as marked, is found to exist between the urea concentration of exudate and that of blood. The difference in the magnitude of the glucose and urea concentration gradient seems to be primarily referable to the respective diffusion coefficient of these two substances. The extent of proteolysis in the exudate of a diabetic dog is definitely more marked than in that of a non-diabetic animal. These facts add further support to previous observations that gluconeogenesis in the inflamed area of a diabetic animal is associated with enhanced local protein catabolism (Bibliography 6, 7). The process of local glucose formation is not primarily referable to the presence of leukocytes but rather to cells in general injured at the site of inflammation.

In a non-diabetic animal the concentration of sugar in exudate is at first higher than that in blood. This effect, however, is transient. This, in turn, is contrary to the findings in diabetic dogs. After the inflammation has progressed from several hours to about a day, the sugar level in exudate of non-diabetic dogs drops to a level usually below that of the blood sugar. This lowering in exudate sugar concentration is referable to an increase in the local glycolytic reaction which thus overshadows the initial effect of glucose formation at the site of an acute inflammation. If, at the beginning of inflammation in a non-diabetic animal, the degree of local gluconeogenesis is marked, the effect may be reflected in the circulation inducing thus a transient hyperglycemia. The available evidence suggests that the temporary elevation in exudate sugar in the inflamed area of a non-diabetic animal is primarily referable to local gluconeogenesis. The difference in reaction from that in diabetic dogs is quantitative in nature. In the latter local

gluconeogenesis is sustained and exaggerated. The effect of abundant glucose production in depancreatized animals cannot be readily obliterated by the slightly elevated local glycolysis. The consequence is constant gluconeogenesis; the glucose in turn diffuses into the circulating blood, thus enhancing the diabetic condition. In brief, injured cells, as manifested by inflammation in both diabetic and non-diabetic animals, are characterized by an increase in their protein catabolic processes and by potentially becoming foci of gluconeogenesis.

2. Studies on the Effect of the Leukocytosis-Promoting Factor on the Bone Marrow.

Earlier studies have shown that a pseudo-globulin can be recovered from various inflammatory exudate which, upon introduction into the vascular system of dogs, will induce a marked rise in the number of circulating leukocytes (Menkin, 1940). Further studies on the purification of the material indicate that preliminary removal of the euglobulin and albumin fractions of exudate will yield an extremely potent leukocytosis-promoting factor in the pseudo-globulin fraction (Menkin, unpublished studies). This factor is absent in normal blood serum, but it is found in the blood serum of an animal having a concomitant inflammation (Menkin and Kadish, 1942). This indicates that it reaches the bone marrow from the site of inflammation via the blood stream. Its effect is to induce a discharge into the circulation of immature leukocytes from the bone marrow. These facts have suggested the necessity of study the effect of this substance on the hematopoeitic tissue of the bone marrow. The femoral bone marrow of dogs was selected as material of study. In a few cases the marrow of ribs was likewise examined. In all cases it was found following even one injection of the leukocytosis-promoting factor that this material induces marked hyperplasia of the granulocytic elements of the bone marrow. The megakaryocytes are likewise increased in number. These facts definitely indicate that the leukocytosis-promoting factor not only induces a discharge of leukocytes from the bone marrow, but it also stimulates active growth of some of the hematopoeitic elements. This substance therefore offers a reasonable explanation for the mechanism of leukocytosis with inflammation by causing active hyperplasia of the bone marrow as well as discharge of immature leukocytes into the circulating blood.

3. Isolation of the Factor Responsible for Tissue Injury in Inflammation.

Inflammation is a manifestation of severe cellular injury in the vertebrate kingdom. Earlier studies have demonstrated that the inflammatory reaction is initiated by a disturbance in local fluid exchange (Bibliography, 3). It then proceeds through a series of interdependent sequences leading thus to the localization or fixation of the irritant and finally to its disposal. The reaction represents essentially an adaptory mechanism in bodily defense. Inflammation can be induced by viable or non-viable irritants; or to be more concrete by either microorganisms, chemical substances, or physical agents. It is important to realize that the reaction has a basic pattern irrespective of the causative irritant. The initial increase in capillary permeability and the early migration of polymorphonuclear leukocytes to the site of injury is referable to the liberation of a crystalline nitrogeneous substance termed leukotaxine (Bibliography 1, 2). The enhanced leukocytosis is due to the liberation of a pseudoglobulin, the leukocytosis-promoting factor (Bibliography 4, 5). Neither of these two important substances reproduce the tissue injury attending the development of the inflammatory reaction. The essentially similar pattern of injury strongly suggests that this too is referable to a common denominator. In other words, the irritant *per se* initiates cellular injury. The cellular metabolic processes are as a consequence deranged. Various by-products are liberated which in themselves are of significance in the subsequent development of the basic pattern of inflammation.

Recent studies have indicated the presence of a euglobulin in exudates of dogs or of man capable *per se* of reproducing the severe edematous injury of the untreated exudate. This protein fraction can be obtained from exudates by precipitation with ammonium sulphate at one third saturation or by dialysis. The material induces a severe inflammation in rabbits which is characterized by redness, edema, and central necrosis. It is thermolabile and non-diffusible. It induces in tissues, as a result of its injurious effect, rapid lymphatic blockade. It can be obtained in the dried state by freezing it in a Flosdorf-Mudd apparatus. Other proteins, such as the pseudo-globulin or albumin fractions of exudates, fail to induce any such injurious effect. Furthermore, the euglobulin of normal blood serum obtained from material devoid of any hemo-

lyzed or lipemic elements is inactive. The name *"necrosin"* is suggested for this active euglobulin fraction liberated from injured cells into exudative material. Its presence offers a reasonable explanation for the basic pattern of injury as manifested in inflammation. Further studies are in progress in an endeavor to determine the various biological and chemical implications of this substance.

These investigations have been aided also by grants from the Permanent Science Fund and the Jane Coffin Childs Memorial Fund for Medical Research.

MENKIN, VALY, 1938. Jour. Exp. Med. 67: 129–144.
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—— 1940. Dynamics of Inflammation, Macmillan Co., New York.
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—— 1941. Amer. Jour. Physiol. 134: 517–541.
—— 1942. Arch. Path. 34: 182–195.
—— 1942 (with KADISH, M. A., and SOMMERS, S. C.). Arch. Path. 33: 188–192.
—— 1942 (with KADISH, M. A.). Arch. Path. 33: 193–197.
—— (with KADISH, M. A.). Amer. Jour. Med. Sciences. (In press.)
—— Amer. Jour. Physiol. (In press.)

JOHN A. MOORE, Queens College

Grant No. 535 (1941), $300. Study of embryonic temperature tolerance and rate of development in Rana pipiens from different latitudes.

During the past year experiments on temperature tolerance, rate of development, and other embryological characteristics of Rana pipiens (including "sphenocephala") have been continued. It is now possible to give a reasonably complete account of the variation of these characters in eastern North American populations of this species.

The embryonic temperature tolerance is the same in individuals from southern Quebec, northern Vermont, southern Indiana, western Wisconsin, Long Island, and central New Jersey. The highest temperature giving 50% survival is 28–29° C. The lower limiting temperature is thought to be 6° C. (equipment for determining this point accurately is not available). Eggs from southern Louisiana are more resistant to heat, the highest temperature giving 50% survival being 32–33° C. These eggs appear to be as resistant

at low temperatures as those from Vermont. Eggs from northern Florida have the same upper temperature limit as Louisiana eggs. Eggs from southern Florida are slightly more tolerant at high temperatures, being able to develop at 34°. At low temperatures however they are much less resistant. They develop normally at 12° but not at 10°.

There is considerable variation in rate of development among the populations. When differences exist between eggs from two localities, the northern ones in general develop more rapidly at lower temperatures and less rapidly at high temperatures than those from the south. The rate of development in eggs from Quebec, Vermont, Wisconsin, Indiana, Long Island, and New Jersey is essentially the same. Eggs from southern Louisiana develop at the same rate as eggs from the above mentioned localities at 15°, but at higher temperatures they develop more rapidly. When a comparison is made between Louisiana and north Florida eggs it is found that the former develop more rapidly at 19° and below, while at higher temperatures the Florida eggs develop more rapidly. In the following table a comparison is made of the rate of development in eggs from three localities. Using those from New Jersey as a standard, the data for the other localities is expressed as percentage acceleration or retardation. Inasmuch as normal development in New Jersey eggs does not take place at 31.4° this point was determined by extrapolation of the rate curve.

	14.6°	19.2°	23.8°	27.5°	31.4°
New Jersey	0	0	0	0	0
Louisiana	+1%	+4%	+ 6%	+ 7%	+22%
North Florida	−5%	+2%	+12%	+14%	+28%

The value of the temperature coefficient *b* is greater in those eggs with a higher range of temperature tolerance. The value of this coefficient for eggs from the northern states is about 2.2, for Louisiana 2.4, and for northern Florida 2.7.

The average diameter of eggs from the northern states is 1.77 mm. Those from Louisiana have an average diameter of 1.60 mm. and those from northern Florida 1.43 mm.

Previous investigations have suggested that among frogs northern species differ from southern species in having: (1) a lower

range of temperature tolerance, (2) a more rapid rate of development, (3) a lower temperature coefficient *b* (4) a more compact type of jelly mass, and (5) larger eggs. The data just presented indicate that differences of this nature separate northern and southern populations of the same species. Thus, northern populations of Rana pipiens have a lower range of embryonic temperature tolerance, a lower temperature coefficient *b*, and larger eggs. Although differences in rate of development do exist they seem best associated with the change in *b* rather than with an additional adaptation to environmental temperature differences (it appears that the time-temperature curve has merely changed its slope rather than been shifted up or down on the time axis).

During the course of these investigations numerous cross fertilizations between individuals of different populations of Rana pipiens have been performed. In most the resulting embryos are fairly normal, but in a few crosses pronounced morphological and physiological abnormalities result. Vermont eggs fertilized with sperm of New Jersey or Oklahoma males develop normally, and at the maternal rate. When fertilized with sperm of Louisiana males they are slightly retarded in neural plate and later stages. If sperm of north Florida males is used a similar retardation is noticed and in addition the gills may be abnormal and the head enlarged. More pronounced abnormalities occur when Vermont eggs are fertilized with sperm of south Florida males. Not only is there a retardation in development but in some experiments all of the embryos have abnormalities affecting heart beat and gill circulation. In other experiments embryos from this same cross although retarded in development have been nearly normal in other respects.

Eggs from New Jersey females fertilized with sperm of Vermont males develop at the maternal rate. With sperm of Louisiana, north Florida, or south Florida males there is a slight retardation in rate first noticed in neural plate stages. In addition embryos from the two last mentioned crosses may have slight gill abnormalities.

Eggs of Louisiana females fertilized with sperm of Vermont males are slightly retarded in developmental rate. They develop normally when fertilized with sperm of south Florida males.

Eggs of north Florida females develop normally when fertilized with sperm of Louisiana and south Florida males. When fertilized

with sperm of New Jersey and Vermont males development is retarded from the beginning of the neural plate stages and pronounced abnormalities may result. Thus, eggs of north Florida females fertilized with sperm of Vermont males frequently have very reduced heads with fused suckers, fused nasal pits, and no mouth opening. The type of abnormality is very different from that observed in the reciprocal cross.

The degree of abnormality observed in these crosses is associated with the distance between the populations. If individuals from two populations closely situated are crossed the embryos develop normally. As the distance between the populations increases the embryos resulting from cross fertilizations become more abnormal.

Moore, John A., 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 136.

—— 1942. The Role of Temperature in Speciation of Frogs. Biological Symposia 6: 189–213.

—— 1942. Embryonic Temperature Tolerance and Rate of Development in Rana catesbeiana. Biol. Bull. 83: 375–388.

Charles Marc Pomerat, University of Alabama

Grant No. 499 (1940), $300. Studies on the carbohydrate metabolism of early development in the frog.

It is well known that carbohydrate is the first food source utilized during cleavage but details concerning the processes by means of which energy liberation is effected are still lacking. Needham has given evidence that a non-phosphorylating glucolytic system is involved. His methods were dependent upon the use of chick brei. Attempts are being made to repeat Needham's observations for the development of the whole amphibian embryo.

Using a series of substances known to inhibit carbohydrate breakdown processes at specific concentrations it has been demonstrated that phosphorylation is not involved in carbohydrate changes during cleavage stages. Glyceraldehyde at M/200, however, has not been found to interfere with development. This is probably due to its conversion into lactic acid by the intact embryo.

It became important to know the exact amount of glycogen present during the course of development. In collaboration with John R. Gregg it was found that, contrary to previous studies, the

glycogen content of developing Rana pipiens embryos decreased during early cleavage then rose again to its original level at neurulation. Following neurulation, glycogen was found to decrease steadily until the time of hatching.

Insulin inhibited development above 0.02% but showed no acceleration of development, change in glycogen content, or in O_2 consumption when sub-lethal concentrations were used.

POMERAT, CHARLES MARC, 1942 (with GREGG, JOHN R.). The Glycogen Content of the Embryo of Rana pipiens during Development. Growth 6: 231–234.

ROBERTS RUGH, Washington Square College, New York University

Grant No. 553 (1941), $400. Study of the effect of increased hydrostatic pressure, applied at critical periods, on the polar body formation and early cleavage of the frog's egg.

The frog's egg normally liberates its second polar body from 20–30 minutes after insemination at 23° C.–25° C., and the first cleavage is achieved in 2½ hours. Inseminated eggs were subjected to hydrostatic pressure of 6000 lbs./sq. in. for 20 minute periods during various phases of maturation and early cleavage, and the effects on later development studied.

This sub-lethal pressure delays cleavage no matter when the pressure is applied after insemination. The least damaging effects are seen in eggs subjected to pressure during the second hour after insemination, following syngamy and prior to the initiation of furrow formation. Many such embryos will eventually hatch but the majority of earlier and later stages, when subjected to this same pressure, will progress toward gastrulation but will finally cytolyze. If newly cleaved eggs are subjected to this pressure the furrow appears to be deepened considerably but upon the release of the pressure the furrow disappears completely with severe cortical wrinkling. In most cases furrows later appear again. In some of the cases where the first cleavage was obliterated the succeeding cleavage resulted in the 4-cell stage.

The cytological aspects of the pressure effect are being investigated in order to determine the relation of the second maturation figure, the polar body, the sperm penetration, and/or copulation paths, and the astral figures to the irregular cleavage history.

ISAAC STARR, University of Pennsylvania

Grant No. 5—Daland Fund (1941), $480. To complete a study of the amount of the circulation in (*a*) Coronary Heart Disease, and (*b*) Soldiers Heart or Effort Syndrome, by means of the ballistocardiograph.

In clinical investigation, unlike laboratory research, the material to be worked upon is largely out of control of the investigator. To make maximum progress, therefore, one must have a large number of interests and advance each of these whenever clinical material presents itself. Therefore the full scope of the work is not easily abstracted.

The grant has permitted the technical assistance which made possible the taking of large numbers of ballistocardiograms on the patients who presented themselves at the medical division of the hospital. Studies which are well advanced include the development of a test for coordination in the circulation and its application to well over one hundred patients. This new clinical conception bids fair to explain certain common symptoms which have had no satisfactory explanation hitherto.

Three subjects have been brought to completion and these are sufficiently defined by the titles under which they have been, or will be published in the near future.

STARR, ISAAC, 1942. Abnormalities of the Amount of the Circulation (Hyper- and Hypokinemia) and Their Relation to Neurocirculatory Asthenia and Kindred Diagnoses. Amer. Jour. Med. Sci. 204: 573.

—— 1943 (with JONAS, L.). On Supernormal Circulation in Resting Subjects (Hyperkinemia) with a Study of the Relations of Kinemic Abnormalities to the Basal Metabolic Rate. Archives of Internal Med. 71: 1–22.

—— 1943 (with WOOD, F. C.). Ballistocardiographic Studies in Acute Cardiac Infarction and Chronic Angina Pectoris. Amer. Heart Journal 25: 81–101.

ALBERT TYLER, California Institute of Technology

Grant No. 627 (1942), $600. Production and properties of univalent antibodies.

Methods previously found to be effective for converting fertilizin (the naturally occurring sperm-agglutinin) into the univalent form were tested on various immune agglutinins (rabbit antisera vs.

sea-urchin sperm, sheep red cells, etc.) and natural agglutinins (human iso-agglutinins). Of the two methods most extensively tested, heat treatment was found to be ineffective while ultraviolet irradiation was partially effective. The latter method gives a variable amount of complete inactivation of the antisera along with the formation of univalent antibody. Various means of overcoming this difficulty are being tested. In the meantime very encouraging results have been obtained by another method of treatment; namely, photodynamic irradiation which had been employed in the treatment of antisera by P. Fleischmann[1] with results strongly indicative of the production of what we now term univalent antibodies. The same photosensitizer was used; namely, eosin, with glass-filtered sunlight or white light of a fluorescent lamp for irradiation and this gave, in antisera that had been exposed until their agglutinin titer was reduced to zero, high degrees (fifty to one hundred per cent in different tests) of conversion to univalents.

To examine antigenic properties, rabbits were subjected to parallel injection series with normal and univalent fertilizin. The present results show that the former acts as an ordinary immunizing antigen whereas the latter fails to induce appreciable antibody formation vs. the original antigen but does give some heterologous antibody formation. In a recent article, J. P. Henry[2] reports obtaining altered and reduced antigenicity of normal horse serum exposed to the same agents, ultraviolet light and photodynamic irradiation, that we have employed. This work accords with our present results and lends additional interest to the investigation in progress of the antigenicity of the univalent immune antisera.

Attempts were made to determine whether or not complement-fixation occurred in the interaction of normal and of univalent fertilizin with antifertilizin. This led to the discovery of a new type of phenomenon, termed "Complement-release," which is described in the article listed below.

In collaboration with Dr. G. T. Rudkin at our Marine Laboratory at Corona del Mar, the immunization of lobsters is being investigated. This was undertaken for two reasons. First to test the possibility that certain species of animals in which the production of humoral antibodies has not been definitely established may actually produce univalent antibodies. Second to determine

[1] Münch. med. Wochensch. 52: 693 (1905).
[2] Jour. Exp. Med. 76: 451 (1942).

whether antibody formation may be obtained with agents that have not been found to be effective immunizing antigens in higher animals. Contrary to our expectations and the findings of others, definite agglutinins (vs. sperm of mollusks) were produced by lobsters although in considerably lower titer than were produced by rabbits receiving a parallel immunization schedule. Preliminary tests show that increase in the aquarium temperature increases the antibody titer. In regard to the second point, injections of Wassermann antigen gave no detectable antibody formation in the lobster.

TYLER, ALBERT, 1942. A Complement-Release Reaction: The Neutralization of the Anticomplementary Action of Sea-Urchin Fertilizin by Antifertilizin. Proc. Nat. Acad. Sci. 28: 391–395.

MEDICINE

PHILADELPHIA INSTITUTE FOR MEDICAL RESEARCH

Grants No. 4—Daland Fund (1941), $6,000, and No. 7—Daland Fund (1942), $6,000. Support of the work of the Philadelphia Institute for Medical Research.

I. Traumatic and Spontaneous Fractures in Exophthalmic Goiter. Frederick Bothe, H. Murry Simpson, and Leonard G. Rowntree.

The study has extended over a number of years. The conclusions are set forth in a paper published by the Surgical Publishing Company of Chicago, 1942. The work endeavors to determine that traumatic and spontaneous fractures have occurred following earlier partial removal of the thyroid gland. Pronounced demineralization of the skeleton was noted in several of the cases; bone changes were extensive.

II. Facial Development in Hypopituitary Dwarfism. M. B. Markus, S. D. Goosman, N. H. Einhorn, and Joseph Lerner.

A thorough medical and laboratory appraisal is essential in a study of retarded growth and development. Without such it is impossible to differentiate cases due to hypopituitarism from those due to dyscrasias of other glands in systemic or metabolic disorders.

To appraise the development of the face and dentition, the method of relating the chronologic age of the patient to their stage of dental development, as employed by Hellman, was used.

The growth and development of the face were found to be definitely retarded, but more particularly in width, and more especially in depth of lower face (mandibular depth). The persistent retardation in lower depth (mandibular depth) demonstrates a tendency toward similarity in pattern of facial development.

All classes of malocclusion existed in the patients reported in this study suggesting caution in attempting to correlate definite types of malocclusion with hypopituitarism.

III. Report of other work.

Several persons have attempted to produce malignancies by feeding wheat germ oil, but were unable to do so. These results are in agreement with the results of our experiments of the past three years. However, no one has reported the results of an investigation of the carcinogenic action of the oil on injection.

In this laboratory rats have been given intraperitoneal injections of crude ether-extracted wheat germ oil at two week intervals for several months. Four strains of rats, a hooded variety, the Buffalo, and two strains of the Wistar variety, were used.

Tumors were obtained only in the two Wistar strains of rats, to the extent of 25—66 per cent of the treated animals. The average was 32 per cent. The tumor was transplanted through five generations.

Guinea pigs injected with tuberculosis are being fed a sulfanilamide derived from Aminocapric acid. The results to date are inconclusive but encouraging.

Work is being done on the synthesis of some sulfanilamides, up to this time unknown, and the physical and pharmacological properties of these new compounds.

H. Schwarz, M. Spiegel-Adolf [1] and W. Ziegler are carrying out investigations on the influence of kidney extracts in hypertension. Part of this work has been done in the Philadelphia Institute for Medical Research, and the other part at Temple University Medical School, and has succeeded so far that through methods of physical chemistry, much more purified extracts have been secured. These preparations proved to be very potent in experimental hypertension, the result of which will be published after proof of the potency of this material in human patients with hypertension.

[1] Temple University Medical School.

BOTHE, FREDERICK, SIMPSON, H. MURRAY, AND ROWNTREE, LEONARD G., 1942. Traumatic and Spontaneous Fractures in Exophthalmic Goiter. Surgery, Gynecology and Obstetrics 75: 357–360.

MARKUS, M. B., GOOSMAN, S. D., EINHORN, NATHAN H., AND LERNER, JOSEPH, 1942. Facial Development in Hypopituitary Dwarfism. Jour. of Orthodontics and Oral Surgery 28: 334–350.

ROWNTREE, LEONARD G., AND ZIEGLER, W. M. A Further Report on the Malignancy Caused by Crude Ether-Extracted Wheat Germ Oil. (Submitted to publisher, result not reported as yet.)

CLASS III. SOCIAL SCIENCES

MODERN HISTORY

RICHARD BRANDON MORRIS, The College of the City of New York

Grant No. 572 (1941), $800. History of labor relations in America in the seventeenth and eighteenth centuries.

This study aimed to investigate the influence of the Tudor and Stuart industrial code and the English mercantilist program in general upon labor relations in the American colonies and states prior to the rise of trade unionism. The current regulations of manpower, wages, and prices during wartime emergency conditions gives special point to evaluating this early experience. As that phase of English mercantilism which aimed at subordinating colonial interests to the economy of the mother country has received considerable attention elsewhere, this investigation concentrated on the transfer and adaptation of the English internal economic controls which patterned to a considerable degree colonial legislation and administrative practice. Studies were made both of the free labor system and the indentured servant system. Over 20,000 cases were collected from the inferior courts of the colonies in areas ranging from Wiscasset, Maine, to St. Augustine, Florida.

The scope and conclusions of the investigation follow:

1. A shortage of labor, especially skilled labor, characterized the entire colonial period. Possessed of broad powers of supervision over strangers, vagrants, and the idle, authority to establish compulsory labor, and the right to impress men to pursue fugitive servants over land and water, nearly every colony experimented in the seventeenth century with a program of fixing maximum wages. The New England group, however, was the most persistent. But

after about two generations the attempt to control wages, either by legislative fiat or local administrative discretion, was gradually abandoned, even more rapidly than in England where the system had become largely ineffective by the latter part of the seventeenth century. However, during the American Revolution, as a result of the rapid depreciation of paper money, various state governments attempted to set maximum wages and prices. These regulations were drawn up by state legislatures and regional conventions and relied for sanctions primarily upon the boycott and social ostracism. They failed, not because of the impossibility of regulation *per se*, but rather because of the failure of the Continental Congress and the states to stem the currency crisis. Without a stabilized currency, control of wages and prices proved impossible of accomplishment. This experience undoubtedly fostered the rise of a laissez faire program during the Critical Period. The abolition of internal restrictions on business, while at the same time providing for the effective regulation of commerce between the states and the protection of home industries from foreign competition would, according to American entrepreneurs, assure a revival of prosperity.

2. Owing to the fluid character of the colonial labor market, workmen's combinations were at best temporary affairs, generally confined to the licensed trades. While such combinations were generally frowned upon by the authorities, there were no such sweeping prosecutions as were found in England as a result of a series of parliamentary enactments. During the Revolutionary era a perceptible momentum toward labor combinations and concerted action by working class groups was effectively diverted from economic into political channels. Masters and journeymen joined in protest against British imperial policy and supported the nonimportation agreements which were a great boon to local industry and employment. The foundations of permanent trade unionism were not really laid until the post-Revolutionary period. Combinations of master craftsmen in this period were not of a permanent nature and the guild system was not successfully transplanted on colonial soil. The most important instances were the agreements of master carpenters of various colonial towns on a scale of prices for their work. On the other hand, for a long time colonial towns strove to maintain the monopoly of the crafts by making the completion of a term of apprenticeship a prerequisite to opening up one's own shop or by limiting the trades and crafts to admitted

inhabitants. By the mid-eighteenth century laissez faire tendencies led to a noticeable decline in the enforcement of these restrictions. In the South white artisans combined, without success, to prevent Negro slaves from driving them out of the labor market. The chief instances of prosecutions for concerted action by workmen occurred in the tobacco provinces and were directed against uprisings of white servants, motivated not infrequently by a desire to better working conditions.

3. This investigation distinguished maritime labor relations from the usual type of master-servant relationship. On the high seas the relations of master and servant were largely determined by a venerable tradition which antedated the common law and found its roots in continental rather than English practices. The essence of these relations was obedience. A strike which might have been treated as an illegal combination at common law would, if participated in by mariners, be deemed a mutiny, for which there were numerous prosecutions in the colonial vice-admiralty courts. The colonial courts, both common law and vice-admiralty, while upholding the traditional discipline of the quarterdeck, made a serious effort to restrain masters who corrected their seamen immoderately or provided them with poor working conditions aboard ship, and mariners found considerable sympathy in colonial courts when bringing suit for wages due, seventy-five per cent of such cases being decided in favor of the mariners.

4. This study investigated the role of the worker during wartime conditions in the Intercolonial Wars and the American Revolution. Consideration was given to such subjects as enlistment or impressment of laborers and servants for military as well as labor services with the armed forces, and their exemption owing to the needs of war industries for trained labor. During the American Revolution the regulation by the military authorities of the wages of artificers working for the army proved as ineffective as other wage controls and for the same reasons.

5. In studying the indentured servant system, attention was paid to the source of bound labor in the colonies: the redemptioners, convicts, victims of kidnapping, criminals convicted in the colonies who were bound out in service in lieu of criminal punishment, the debtor, and the pauper and orphan. The transplantation to the colonies of the Tudor apprenticeship system is considered as an effort to provide skilled labor. In addition, the legal status of the

bound servant was examined and compared with the slave. The master's quasi-proprietary interest in the services of his servant was analyzed. Servants could generally be sold or assigned, were deemed the property of the estate, and strict laws were promulgated relating to harboring or enticing them. These laws are in part the source of the modern civil action for causing a breach of contract. The extent of the fugitive servant problem is considered, the heaviest extra service penalties being exacted in Pennsylvania and the southern colonies where the problem was most severe. The ineffectual efforts of the administrative and judicial machinery in restoring fugitive servants to their owners is brought out by comparing fugitive servant cases coming up in the colonial courts with newspaper advertisements of runaways for the same period. The master's liability for the acts of his servants and the relation to the common law of vicarious liability is examined, as well as the master's right of discipline and the servant's right of redress. Finally, the legal and political rights of servants are evaluated, including the servant's right to petition for freedom, his right to his own personality and realty, to freedom dues, to suffrage, and his rights in court as litigant and witness.

Pennsylvania Historical Association

Grant No. 566 (1941), $1,500. Preparation of a critical bibliography of Pennsylvania History.

Students of Pennsylvania history have been handicapped by the lack of an adequate bibliography of a secondary nature, viz., a classified compilation of printed volume and periodical materials relating to the many aspects of the history of the State. Aware of this need, the Pennsylvania Historical Association took steps in the mid-1930's to have such a compilation made. Dr. A. C. Bining and Dr. R. L. Brunhouse successively directed the project until May, 1942, when Mr. N. B. Wilkinson assumed the task of compiler.

There have now been accumulated approximately 5000 entries of volume length and about 7000 items of a periodical nature. In the selection of materials the compilers have been guided by a very broad interpretation of what constitutes history. About 600 volumes have been annotated by recognized authorities in their respective fields of study. Approximately 100 volumes await annotation. Classification of nearly all of the 5000 book entries has been

completed. Classification is made according to a syllabus drawn up by a committee of the Pennsylvania Historical Association.

Periodical entries are still being added, elusive volumes of a series located, and a check for correct bibliographical data continues. As far as possible periodical articles issued up to and including October 1942, will be incorporated. Local, state and general historical publications have been combed; other publications not of a strictly historical nature but often containing pertinent material have been scanned; and use has been made of all the standard periodical indices. Classification of periodical material is now beginning.

The *Pennsylvania Bibliography* will also contain appendices which may prove useful. Published guides to manuscript collections will be listed; general and topical bibliographies containing entries on Pennsylvania will be enumerated; inventories of the county archives of Pennsylvania will be noted. If feasible, a listing of all local historical societies and their publications will be included.

In the hope that it will make the *Bibliography* more generally useful a compilation of fiction about Pennsylvania, or in which the State is the setting, has been made. The better works are annotated and will be cross-referenced with the part of the *Bibliography* to which they pertain. This device should recommend the *Bibliography* to secondary and college classes studying Pennsylvania history.

It is planned to have the *Bibliography* ready for printing early in 1943.

GOVERNMENT

HANS J. MORGENTHAU, University of Kansas City

Grant No. 467 (1940), $460. The relationship between the political philosophy of liberalism and foreign policy, with special reference to the basic ideas of pre- and post-World War foreign policy.

During 1942, two fundamental problems bearing upon modern political philosophy were investigated: the scientific character of politics and the limitations of social planning.

The quest for the technical mastery of social life, comparable to the one over nature, took its point of departure from the belief in the fundamental identity under reason of physical nature and social life. Since reason reveals itself most plainly in nature, nature be-

came the model of the social world and the natural sciences the image of what the social sciences one day will be. There is only one truth, the truth of science, and by knowing it man would know all. This was, however, the wrong answer. Its universal acceptance initiated an intellectual movement and a political technique which retarded rather than furthered man's mastery over the social world.

The very concept of physical nature as the paradigm of reason, from which the anology between natural and social world derives, is invalidated by modern scientific thought (see, e.g., Eddington, Jeans, Planck, Whitehead). The physical world of the nineteenth century is composed of matter, moving in time and space according to the law of gravitation and evolving in a continual development according to the law of causation. Of this rational, calculable universe little is left today. Matter has been dissolved into electronic atoms. The traditional concepts of time, space, and the law of gravitation have succumbed to the theory of relativity. The quantum theory has transformed causation into statistical probability and replaced determinism by the principle of indeterminacy. Modern science is marked by an ever-widening cleavage between nature as perceived by our unaided senses in seemingly complete rationality, and nature as constituted by scientific theory.

The surprising thing is that the structure of the natural world, as described by modern science, finds its counterpart in the social world. The best the so-called social laws can do is exactly the best the so-called natural laws can do, namely, to indicate certain trends and to state the possible conditions under which one of those trends is most likely to materialize in the future. Which of the possible conditions will actually occur and thus help one particular trend to materialize, neither the natural nor the social sciences are able to foretell. Nor are they able to forecast with more than a high degree of probability that in the presence of certain conditions a certain trend will materialize. What can be stated scientifically in way of prediction on the basis of "law" is merely that given certain conditions a certain trend is more likely to materialize than others, in other words, that the odds are in favor of one trend as over against others.

Any distinction one can make between the certainty of which the natural and social sciences are capable is therefore bound to be of a mere quantitative nature. It can be shown that with re-

gard to individual events as such neither natural nor social sciences can make any certain statement at all and that whatever certainty they are able to achieve deals with averages of groups of similar events. The social sciences, however, are to a much greater extent than the natural sciences interested in individual behavior as such, and even where the average behavior of groups is under consideration, the course of events depends largely upon individual behavior as such. This emphasis upon individuality as such extends the domain of uncertainty immeasurably. The same element of uncertainty from which the natural sciences suffer, affects the social sciences, only more so. Because of its quantitative extension it affects here not only theoretical structure but also practical usefulness.

In the same way in which the liberal belief in the rationality of the social world was rooted and found ever renewed confirmation in the mechanical physics of Newton and Descartes, the new physics of relativity and quantum is becoming the point of departure for a thorough revision of this belief. The new physics shows indeed that there exists a close correspondence between the human mind on the one hand and nature and society on the other. Modern scientific thought reestablishes the unity of the physical and social world at which the liberal age aspired in vain. Yet the common element of which mind, nature, and society partake, is no longer reason pure and simple but reason surrounded, interspersed, and underlaid with unreason, an island precariously placed in the midst of an obscure and stormy ocean.

Since the rationality of the social world consists in a limited number of potential trends one of which is bound to materialize, social planning, correctly understood, is then the marshalling of human and material forces in rational anticipation of those potential trends. Social planning, thus understood, is able to provide, not the one correct solution for all the problems of social life, but a series of alternative and hypothetical patterns one of which will supply the rational foundation for an approximate solution of a specific social problem. The general staff's preparation for "every eventuality" refers to this kind of alternative planning for a limited number of potentialities. Wherever planning has been successful it has followed this pattern. It is for this very reason that military strategy is the only field where the legitimacy of social planning is undisputed. It is for the same reason that social plan-

ning in the political sphere has been widely unsuccessful. For political planning in our time is essentially rationalistic planning after the model of the natural sciences, following in its analysis of reality the "method of the single cause" and in its constructive endeavors the universal blueprints of rationalistic philosophy.

MORGENTHAU, HANS J., 1941–42. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1940: 224–225; for 1941: 211–214.

CLASS IV. HUMANITIES

ETHNOLOGY

JOHN P. GILLIN, Duke University

Grant No. 629 (1942), $700. Study of cultural modifications and environment adjustment in Guatemala.

This project was financed in equal parts by the American Philosophical Society and by Duke University, and enjoyed the material and scientific aid of the Carnegie Institution of Washington in Guatemala.

The objectives were primarily (1) to analyze cultural adjustments in contrasting environmental situations of the tropics, and (2) to analyze cultural adjustments in such situations to the encroachment of "European" or "modern" civilization, with a view to projecting the findings to other comparable situations in Latin America.

In Guatemala two communities were chosen for work: San Luis Jilotepeque on the eastern highlands of the Department of Jalapa, and Guazacapán in the Pacific Coast region of the Department of Santa Rosa. Neither of these communities had previously been investigated by anthropologists. The first is in a highland tropical setting, the second on a low, wet tropical coastal plain. In each case the vast majority of the population is Indian, uses an aboriginal language in addition to Spanish, and has preserved much of the aboriginal culture. The Indians of San Luis Jilotepeque are Mayan of the Pokomán branch. Those of Guazacapán are reputed to be Aztec of the Pipil branch. Analysis of the vocabularies and other linguistic material collected is still in progress and may shed new light on the aboriginal affiliations of both of these groups.

In each community a large amount of material concerning the respective aboriginal cultures was collected, against which an esti-

mate of past and future changes could be made. A careful survey of sociological groups and relations of both Indians and *ladinos* was made in each community, and an analysis of the agents, the volume, and the rate of flow of "modern" cultural elements into the community. The Jilotepeque situation, for example, showed an incipient caste relationship developing between Indians and *ladinos.* A close study of agriculture and other subsistence patterns was made in each community, and a survey of health, residential constructions, clothing, and dietary practices. Each community was mapped in order to show the distribution of individuals, house types, and subsistence features. In addition to objective recordings, a large amount of interview material was collected bearing upon the problems under study. In order to provide a contrast with the lowland tropical community of Santa Rosa a four-day survey was made of the living conditions, work patterns, and organization of the community of Tiquisate, a pre-planned tropical development of the United Fruit Company on the Pacific coastal plain.

As a matter of record over one hundred colored still photographs were made, about five hundred still black-and-white photographs, and three rolls of 16-millimeter motion picture film.

The records of the field work are now being analyzed and should be written up within six months. A summary of conclusions will have to await completion of the analysis.

DOROTHY M. SPENCER, University of Pennsylvania

Grants No. 357 (1939), $1,500, and No. 26—Johnson Fund (1940), $300.

The purpose of the second grant was the continuation of work begun in 1939, a report on which was published in the Society's YEAR

A study of the Ethnology of one of the Muṇḍā-speaking peoples of India.

BOOK for 1940. Additional funds from other sources enabled me to remain in the field until August 1942. Since the first year was spent in making a survey of Muṇḍā ethnology, it was possible to devote the remainder of the time to intensive work on various aspects of the culture, chiefly law, economics and religion.

Legal mechanisms in Muṇḍā society center around the *panchayat,* a council composed of men from the village or villages concerned, who interrogate witnesses, discuss the evidence and decide upon the penalty to be imposed. Violations of caste rules, in-

fringements of the moral code, and criminal offenses are investigated by the council. I attended a number of councils and in addition collected a large amount of case material dealing with meetings which had taken place during the past thirty or forty years.

In the field of economics an intensive study was made of the methods of agriculture, with emphasis on rice cultivation. Concepts of property, the nature of ownership and inheritance, the use and distribution of wealth were investigated; special attention was paid to their relations to social and legal customs. Of particular importance, not only from the point of view of an ethnologist interested in the Muṇḍās, but also from that of a student of Indian village economy, is the interdependence which exists among the various caste groups constituting a Muṇḍā village. Detailed accounts were obtained of the types of work and reciprocal obligations of each caste.

In Muṇḍā religion one of the most important roles is that of the diviner, who functions chiefly in connection with the diagnosis and cure of disease. The theories of divination, the methods of training, and the practices of diviners were studied. An interesting problem in Muṇḍā religion is the extent to which aboriginal beliefs and practices have been influenced by Hinduism. It is hoped that materials collected in the course of the study of divination, and of other religious complexes, will enable some conclusions to be drawn regarding this question.

FAY-COOPER COLE, University of Chicago

Grant No. 575 (1941), $1,500. For continuation of collection, preparation, and use of manuscript materials relating to period of contact between Whites and Indians in the Mississippi Valley in the Ethno-History Program.

For a number of years this program has been selecting documentary materials in archival and historical manuscript collections in this country and abroad which relate to the period of contact between Whites and Indians in the Mississippi Valley. The selected material is microfilmed or photostated and in copy forms a growing library of primary source materials in the department. A special system of calendaring has been evolved which permits classificatory search by the anthropologist by tribe, area, period and subject, in addition to the customary calendar analysis for the

historian. The collected materials are being used in connection with various anthropological problems.

During the period of this grant some materials have been added to the collection, especially seventeenth century French materials in Canada and in the Manuscript Division of the Library of Congress. A series of these documents of the seventeenth century has been translated and will be published in a forthcoming volume of the *Scientific Papers* of the Illinois State Museum.

The library of published manuscripts, dictionaries, guides, calendars, and so on has been markedly increased and a checklist prepared in the spring of 1942. It is planned this checklist will be brought up to date before the close of the year.

Two research problems have been the major studies for 1942. One is a preliminary assay of potential primary sources for the lower Ohio Valley between 1500 and 1700. Secondly an historical Atlas has been completed and published which is Part I of Volume II of the *Scientific Papers* of the Illinois State Museum. This study is a consideration of the tribes formerly occupying Illinois, their movements, villages, and relations with each other. Part I presents a series of fifty-four maps, mostly manuscript, bearing on the subject, reproduced by the collotype process. A section of annotated notes facilitates the use of the maps. Part II, in preparation, will present further manuscript documents with an analysis of all the materials reproduced in both Part I and Part II.

Calendaring of the documents in the collection has continued. It is expected the Letter Books of Governor Lewis Cass from 1814 to 1823 can be finished this year.

This grant has been used to continue the services of Mrs. Sara Jones Tucker, who is assisting in the Ethno-History program.

Tucker, Sara Jones, 1942. Indian Villages of the Illinois Country, Part I, Atlas Scientific Papers, Ill. State Mus. 2.

ANCIENT, MEDIEVAL, AND CULTURAL HISTORY

George N. Kates, Guest Worker in the Library of Congress

Grant No. 594 (1941), $600. Study on the Three Lakes of the Imperial City in Peking.

During the course of research it was discovered that behind the *Yüan* Forbidden City, in Peking—hitherto taken for granted as built *de novo* by order of Kubilai Khan, between 1264 and 1281

—loomed an earlier palace, the *Wan-ning kung* of the *Chin* dynasty (1115–1234). This it was possible to fix as having existed on this same site, to the east of the imperial lakes; although it was in *Chin* times a detached palace to the northeast of the walls of the earlier *Chin* capital, before KUBILAI radically shifted and rebuilt it. By tabulating references to imperial sojourns mentioned in the *Chin* official history, it was further possible to prove that this was originally the summer palace for the *Chin* court; and the residence of several of the *Chin* emperors for as many as five months out of the year.

Vaulted construction of the bath-houses on the imperial island in the North Lake, or *Pei-hai,* also engaged the writer's attention. Since, in the south city, one local *Yüan* example does by good fortune still exist, this was considered in an essay titled "A Domical Vaulted Bath-House of the Late Thirteenth Century in Peking," now ready for publication in the near future. It should be emphasized that this very untypical use of vaulting, in a region where tiled roofs over wooden framing are almost invariable, brings into consideration an interesting aspect of influence from regions far to the west of China; and is merely another proof of the international character of the *Yüan* period in general.

Further, several smaller essays, on "Fountains in China" and "A Forgotten Garden" to the west of the *Pei-hai,* have been sketched out; and materials prepared.

The chief work of the last year, however, has been on a much larger project, still in course, now being done with the help of a Guggenheim Fellowship. This is titled "The Imperial Lakes of the Forbidden City in Peking"; and the first part of it, dealing with a period from the origins to the end of the *Yüan* dynasty in 1368, already exists in manuscript form, the bulk of the work complete.

It is there proved that these artificial lakes, with the gardens about them, the origins of which had never been scientifically determined by the Chinese themselves, must have been dug within the decade from 1151 to 1161; and quite possibly between 1156 and the latter year.

This work as a whole comprises a large number of excerpts, in direct translation, from the standard histories, from prose texts, and collections of poems, that will make together a corpus of materials specially illustrative of the social habits and customs of three earlier dynasties, *Liao* (907–1125), *Chin* (1115–1234), and

Yüan (1260–1368), that successively occupied this part of North China.

KATES, GEORGE NORBERT, 1943. A New Date for the Origins of the Forbidden City. Harvard Jour. Asiatic Studies. (In press.)

E. A. SPEISER, University of Pennsylvania

Grants No. 471 (1940), $600, and No. 599 (1941), $600. Completion of the study of Nuzi Legal procedure and other problems of cuneiform law in the second millennium B.C.

The documents of the comparatively large number of law suits yielded by the excavations at Nuzi made it possible to reconstruct the adjective law of this Hurrian settlement to a considerable extent. The fact that all these documents come from a limited period (around 1500 B.C.) has been a further advantage in this investigation. In two previous studies (see YR. BK. Amer. Philos. Soc. for 1941: 217–218) an extraordinary procedural means, comparable to our injunction, and the law of evidence have been dealt with. The present investigation was devoted to a reconstruction of the legal procedure in Nuzi in general.

The ordinary law courts of Nuzi were always composed of more than one judge. The total number of judges sitting in a case varied, however, considerably; so far no rule governing these variations has been found. Cases could also be brought before the King's court. In that case the entire suit was heard by the King who also pronounced the sentence. In Babylonian law the King merely examined the proofs and left the final decision to delegated officials. Contrary to Babylonian law all courts, not merely the King's court, could pronounce binding sentences. No evidence could be found for the existence of temple courts, which play such an important rôle in Babylonian procedure.

Several plaintiffs or defendants could appear jointly in a suit. The party could also be represented in court by a member of his household or his family and possibly also by an outsider. Whether the representative in the latter case could act for an undisclosed principal is not certain. If the defendant resided outside the kingdom of Arrapha, of which Nuzi formed part, personal suits had to be brought before a tribunal at the defendant's residence. The jurisdiction in suits concerning real estate was determined in such cases by the place were the real estate was located. A parallel to this rule can be found in Hittite law. The parties mostly appear

in court together, and therefore little can be said about the normal form of summonses. There existed an elaborate system of summonses by court officials in cases of actions by default. The court proceedings were oral throughout. Witnesses and parties were interrogated by the court. No evidence of cross-examination has been found.

The judgments of the Nuzi courts were either interlocutory, contingent, or final. The final judgments were binding and the *ṭuppu lā ragāmim* ("contract not to sue again"), which is an important feature in Babylonian law, is therefore not found in Nuzi.

There is only little evidence for an appelate jurisdiction in the sense of a review by a superior court of the decision of an inferior court. Several cases of retrials have been found, however. In these instances the parties sought redress against wrongs inflicted by the courts by appealing to the King or other high officials.

The sentence could be enforced by execution against the person as well as against the property of the debtor in judgment. Execution against the person was not restricted to the debtor himself but extended to his family.

The system of legal procedure presented by the records from Nuzi is a blending of different legal elements. The most prominent among these are Hurrian, Babylonian, and Assyrian. It is perhaps noteworthy that the system of procedure retained distinctive features, as compared both with the Babylonian and the Assyrian law though even the official language of the records was Akkadian.

This investigation was carried out by Herbert Liebesny.

SPEISER, E. A. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 217–218.

LIEBESNY, HERBERT, 1943. The Administration of Justice in Nuzi. Jour. Amer. Or. Soc. (In press.)

EDGAR ZILSEL, Hunter College

Grant No. 601 (1941), $600. Study of the origin of science and the rise of the scientific methods in the period from the end of the Middle Ages to Galileo.

In 1942 the methods of humanism and the genesis of the ideas of scientific progress and scientific cooperation were studied.[1]

[1] An outline of the entire study was published in the Am. Jour. Sociol. 47: 544–562 (1942), under the title: The Sociological Roots of Science. Special problems are treated in: Copernicus and Mechanics, Jour. Hist. Ideas 1: 113–

1. The Methods of Humanism. Summary of the findings: The humanists descend from political secretaries of late medieval princes, municipalities, and the curia. These secretaries were supposed to increase the prestige of their employers through the polished Latin of their diplomatic correspondence and their erudition. In the fifteenth and sixteenth centuries their offices tended to become sinecures and the humanists turned into court poets, free literati, and lecturers. Viewed sociologically, however, dispensing of prestige and fame always remained their chief task. Although the humanistic literati were the first secular scholars in the modern era their professional ideals—mastery of style, fame, and erudition—essentially differ from the aims of modern scientists. The humanists are akin rather to the scribes of ancient Egypt and the Confucian scholars in China. In the development of society the social esteem of knowledge has two different roots. On the one hand, knowledge can be esteemed because it is useful (control of nature, physical laws, science); on the other hand, he who knows more than his neighbors is proud of his superior knowledge even if it relates only to words or disconnected and therefore useless facts (scholarship). Superior knowledge gives social privileges and can, under favorable conditions, become the basis of a privileged professional group (scribes, humanists). Remarkably enough in the development of civilizations scholarship is older than science. Modern science did not develop from humanism but descends from artist-engineers, instrument-makers, surgeons, and other superior artisans who were, however, despised by the humanists as representatives of the "mechanical arts." Even those humanists who edited and translated the works of the classical mathematicians and astronomers had little understanding of the scientific problems and methods.

2. The theoretical aims of the classical authors and the origin of the ideal of progress were studied. Summary of the findings: in classical antiquity the idea that the fund of knowledge is increased step by step through contributions of cooperating scientists was virtually non-existent. The literati strove for individual fame and did not care for cooperation. The philosophers believed in the final truth of their doctrines or denied the possibility of any truth. Sci-

118 (1940); The Origin of William Gilbert's Scientific Method, ibid. 2: 1–32 (1941); The Genesis of the Concept of Physical Law, Philos. Rev. 51: 245–279 (1942).

entific specialists were less numerous and the special sciences less separated from speculative metaphysics than in the modern era. A combination of metaphysics and rhetoric took the place of modern scientific instruction. Compared to the modern era, the aims of the classical theorists were considerably more individualistic. The following classical phenomena were, comparatively, nearest to the modern idea of scientific progress: the Hippocratic doctors sought to establish a tradition of knowledge in their corporation and published case histories of their patients. The classical astronomers composed star catalogues based on the observations of their predecessors and intended to be used by their successors. Yet, "schools" combatting or ignoring each other were, approximately, as frequent in classical science as in modern philosophy and the store of generally recognized knowledge remained, comparatively, small. On the other hand, the builders of war machines clearly recognized the gradual growth of technological skill through the method of trial and error (Philo of Byzantium). This insight, however, did not ascend to the ranks of scholars, since manual labor and applied science were looked down upon in the educated classes.

The ideal of progress of knowledge was unknown also to the representatives of the "liberal arts" in the Middle Ages and the Renaissance. It first appears, in an embryonic form, in vernacular technological treatises composed in the fifteenth and sixteenth centuries by superior artisans (the master builder Mathias Roriczer, the gun-maker Brunner, the gunner and surveyor Bourne, the compass-maker Robert Norman). It is expressed more clearly in the treatises on applied mechanics of Tartaglia and Simon Stevin who both were close to the artisans. In the sixteenth century also academically trained scholars began to apply themselves to problems of the "mechanical arts." All of them advocated an utilitarian concept of science and several of them also scientific progress (Peter Apian, Gerard Mercator). And, finally, the barrier between liberal and mechanical arts broke down and progress and scientific cooperation were proclaimed as a scientific program by Francis Bacon. In the seventeenth century this program was realized. In the laboratories of the Accademia del Cimento and the Royal Society for the first time scientists collaborated in order to increase knowledge systematically.

ZILSEL, EDGAR, 1943. The Genesis of the Ideas of Scientific Progress and Scientific Cooperation. Jour. Hist. Ideas (Accepted).

ARCHAEOLOGY, HISTORY OF ART

OTTO BENESCH, Harvard College Library, Treasure Department

Grant No. 541 (1941), $500. Completion of a corpus of Rembrandt's drawings.

The research carried on during the winter of 1941–42 in the Houghton Library (Treasure Department of Harvard College, Library) furthered new results in the history of book-illustration of the Baroque, particularly with reference to Rembrandt. Rembrandt's connection with outstanding intellectual personalities of his country resulted in occasional commissions for book-illustrations. From the point of view of the history of religion, the most important among them are those which he did for Rabbi Manasseh Ben Israel's book *Piedra Gloriosa.* A new explanation of the religious and historical background of these illustrations was for the first time brought before the public in a lecture given at the Houghton Library, entitled "Rubens, Callot, and Rembrandt."

The whole series of lectures which were given at the Houghton Library in the Spring of 1942, is going to be published in book form under the title *Artistic and Intellectual Trends from Rubens to Daumier as Shown in Book-Illustration.*

HETTY GOLDMAN, The Institute for Advanced Study

Grant No. 576 (1941), $500. Catalogue of the coins found during the excavations at Tarsus, 1934–38, and a numismatic history of Tarsus.

In the excavations at Tarsus, 1934–38, sponsored by the Archaeological Institute of America, Harvard University, and Bryn Mawr College, only small historical areas were examined. There fewer than four hundred legible coins were found ranging from the fourth century B.C. to the nineteenth A.D.

Only one, a bronze of Philip II, antedates Alexander's conquest of Cilicia. Two tetradrachms and thirty-two bronzes of Alexander were identified. Half the bronzes showed on the reverse, ΑΛΕΞΑΝΔΡΟΥ between a club above and a bow within quiver below, a type attributed to the mint of Tarsus.[1] On most of the remaining pieces the club was above the name and a bow-in-case below, and above all a bunch of grapes. Tetradrachms with this symbol have recently been attributed to the mint at Nagidos,[2] but

[1] Newell, E. T. Tarsos under Alexander. Amer. Jour. of Numismatics 52: 103 ff. (1918).

[2] Lederer, Ph. Die Staterprägung der Stadt Nagidos. Zeits. für Numismatik 41: 267 (1931).

the number of these coins found at Tarsus makes an attribution to Soli, which is near Tarsus, more probable.

Several bronzes:

obv: Macedonian shield, Herakles head on boss.

rev: Macedonian helmet between letters A B.

were found well stratified between the Alexanders and coins of Seleucus I, for which reason they were attributed to Antigonus I and because of the find spot as well as the Herakles' head (patron god of Tarsus) to the local mint. Since similar coins have been found at Olynthus and Cyprus it is suggested that all were struck after the general armistice of 311 B.C. which confirmed Ptolemy in the possession of Cyprus, conceded Thrace to Lysimachus and Cilicia to Antigonus as general of all Asia.

The small number of Seleucid coins found warranted no definite reattributions, but were suggestive. All four bronzes of Seleucus II found at Tarsus are of one type and inscribed with monograms used on contemporary silver from that mint, a coincidence casting some doubt on the attribution of these coins to Apame.[3]

Four small anonymous bronzes, hitherto unpublished, seem to be the earliest products of the Tarsus mint after autonomy had been granted the city (c. 180 B.C.?) *obv:* Head of Tyche r., *rev:* Bow in gorytus and magistrates' monograms. An effort was made to sub-divide the subsequent autonomous bronze chronologically. The countermark of a radiate head r., so common on the poorer of these coins, was interpreted as the head of Mithra and attributed to the reign of Tigranes.

The stratification of the coins seemed to show that the word "Metropolis" was not used on the coins of Tarsus before the time of Tiberius.

Samuel Noah Kramer, University Museum, University of Pennsylvania

Grant No. 42—Johnson Fund (1942), $6,000. ($3,000 from 1942 budget and $3,000 from 1943 budget.) Copying of Sumerian literary tablets and fragments and reconstructing and translating the Sumerian literary compositions.

The study in the course of the past several years of the approximately 675 unpublished Sumerian literary tablets and fragments

[3] Newell, E. T. Western Seleucid Mints, New York, Nos. 1172 and 1176 (1941).

in the Nippur collection of the University Museum has clarified to no small extent the nature, scope, and significance of Sumerian literature; it is this unpublished material which will enable us to reconstruct the larger part of the texts of a group of Sumerian compositions which furnish an excellent cross-section of Sumerian literature as created and developed primarily in the third millennium B.C. This literature can now be classified as follows: (1) *Epic Tales;* these deal largely with the feats and exploits of the heroes Enmerkar, Lugalbanda, and Gilgamesh, and with those of the god Ninurta and of the goddess Inanna. (2) *Myths;* these deal with the organization of the universe and the establishment of civilization and involve the creation of numerous cultural deities and the creation of man; also with such varied subjects as the Nether World, the journeys of the gods Enki and Sin to Nippur, the marriage of the god Martu, the death and resurrection of Tammuz. (3) *Hymns;* these may be classified as *royal* and *divine.* The *divine* hymns are mainly addressed to the gods Enlil, Enki, Sin, Utu, and Ninurta, and to the goddesses Inanna and Bau, although occasional hymns are addressed to other deities. To be included among the *divine* hymns are also two *temple* hymns; one of these is a long composition of more than 450 lines consisting of *41* brief hymns dedicated to all the more important temples and shrines of Sumer and Accad, whose contents when fully reconstructed and trustworthily translated will prove to be a major source for the study of Sumerian religion. As for the *royal* hymns, these are devoted primarily to the kings of the Ur III Dynasty and of the Isin Dynasty, that is, to kings ruling at the end of the third and the beginning of the second millennium B.C. (4) *Lamentations;* two compositions are devoted to the destruction of Ur; one to the destruction and restoration of Nippur; one laments the destruction of Sumer and Accad as a whole; one is the "weeping mother" type; one laments a calamity that befell the city of Agade in the days of Naram-Sin. (5) *Wisdom Compositions;* these consist of collections of proverbs; collections of wisdom paragraphs; fables: "The Bird and the Fish," "The Tree and the Reed," "The Pickax and the Plow," "Silver and Bronze"; didactic compositions, several of which are devoted to the learning of the scribal art.

The past year was again devoted primarily to the study of the Sumerian epics and myths; it resulted in the preparation of a small volume entitled *Sumerian Mythology* which will appear in the near

future as a Memoir of the American Philosophical Society. This volume furnishes a cross-section of the hitherto practically unknown Sumerian mythology and consists of three parts. (1) An introduction devoted to a description of the nature of our source material, the tablets dating approximately 2000 B.C. (2) A brief chapter on the scope and significance of Sumerian mythology. (3) A sketch of Sumerian mythology which begins with the myths centering about the creation and organization of the universe and the creation of man; continues with the myths involving Kur, consisting of three versions of a dragon-slaying *motif* and of the poem "Inanna's Descent to the Nether World"; concludes with an outline of three miscellaneous myths.

The volume, *Sumerian Mythology,* is the first and introductory work of what is hoped to be a seven-volume series bearing the title *Sumerian Culture: A study of Spiritual and Literary Achievement in the Third Millennium B.C.* to be prepared in the course of the coming decade. The five volumes to follow *Sumerian Mythology* will consist primarily of source material; they will contain the transliterated texts of the restored Sumerian compositions together with a translation and commentary as well as the autograph copies of all the pertinent uncopied material in the University Museum utilized for the reconstruction of the texts. Each of these five volumes will be devoted to a particular class of Sumerian compositions, thus: (1) *Epics;* (2) *Myths;* (3) *Hymns;* (4) *Lamentations;* (5) *Wisdom.* The seventh volume, *Sumerian Religion: A Comparative Study,* intended as the last of the series, will sketch the religious and spiritual concepts of the Sumerians as revealed in their own literature; moreover, it will endeavor to trace the influence of these Sumerian concepts on the spiritual and cultural development of the entire Near East. While, then, the first six volumes are to contain primarily the data and the sources it is the seventh which will attempt to formulate the results and conclusions for the historian and the layman.

KRAMER, SAMUEL N., 1942. Report of Progress. Yr. Bk. Amer. Philos. Soc. for 1941: 237–238.

—— 1942. The Slaying of the Dragon. Gen. Mag. and Hist. Chron. of the Univ. of Penna. 44: 358–364.

—— 1942. The Oldest Literary Catalogue: A Sumerian List of Literary Compositions Compiled Approximately 2000 B.C. Bull. Amer. Schools of Oriental Research 88: 10–19.

A. Leo Oppenheim, New York, N. Y.

Grant No. 595 (1941), $1,200. Lexicographical research on the culture of the Neobabylonian epoch.

The studies undertaken with this grant are based upon a complete glossary of all published Neobabylonian texts (legal, administrative and epistolary) which had been begun by the writer for the "Institut d'Assyriologie" of the "Collège de France, Paris," and was completed (on cards) in this country.

With a view to a complete presentation of the material culture of the Neobabylonian epoch, as recorded in those documents, the writer finished during this year the first two parts of a manuscript of about one hundred thousand words entitled "The Material Culture of the Neobabylonian Period based upon its documents."

The first part deals with the metals: the techniques of alloying and refining gold and silver, the fabrication of bronze, the various forms of silver-currency are discussed, special attention being given to all objects made of gold, silver, copper, iron, tin and lead. The craft of the metalworkers, the technical terms denoting their tools and several techniques have been made the object of numerous separate investigations. The second part comprises "Animal Husbandry" and its products. It deals first with the manifold activities of the shepherd, and proceeds then to the complicated terminology used by the Mesopotamian cattle-breeders. Special care has been devoted to an exact presentation of the techniques of tanning hides and of preparing wool (carding, combing, dyeing, etc.) which so far have never been studied systematically. The rich and valuable information regarding the costume of this period which these texts contain have also been utilized for the first time: all objects made of leather and wool are listed and philologically discussed.

As this study is mainly lexicographical (more than 1300 words are discussed in the first two parts) its results cannot be reported here even in condensed form but the writer feels entitled to state that he was able to show the continuity of the material culture as the essential feature in the development of Mesopotamian civilization. From the earliest Sumerian period to that of the Persian and Greek domination, nearly two millennia later, neither inventions nor foreign influences transformed the stock of technical

knowledge in the fields of agriculture, metallurgical and textile technique, etc. Methods, tools and objects remain the same and their names do hardly change during this period in spite of frequent social, ethnical and political disturbances.

The writer expects to finish his work on this material with a detailed study of Mesopotamian agriculture (methods and products) and of various other topics (*e.g.:* commodities, such as perfumes, spices, objects made of clay, etc.; construction and form of the private house, etc.) which are recorded in the Neobabylonian texts.

OPPENHEIM, A. L., 1943. Akkadian *melammu* and *puluhtu.* Jour. Amer. Oriental Soc. (In press.)

BERTA SEGALL, Museum of Fine Arts, Boston

Grant No. 584 (1941), $1,200. History of Greek and Roman jewelry, from the Geometric to the late Imperial periods, based on the evidence from datable tomb groups.

Research during 1942 centered around three main tasks:

I. Study of objects in American collections.

A. Completion of study of the classical jewelry in the Museum of Fine Arts, Boston.

B. It was possible to examine the collection of classical jewelry in the Metropolitan Museum of Art in New York, before it was sent away for the duration of the war. The main problems raised by this study and partially followed up were:

1. The role of Cyprus in (*a*) the spreading of oriental types in the archaic period; (*b*) in reorientalizing of Greek types in the fourth century B.C.; (*c*) in the spreading of Alexandrian types in the early Roman period.

2. Problems dealt with in II and III:

II and III. Research on special chapters of the history of jewelry, with the facilities of the Boston Museum of Fine Arts, arising from the study of individual objects recently examined in New York and Boston.

II. Early archaic Greek and Etruscan jewelry and its sources.

The earliest types of orientalizing jewelry in Greece and Etruria were analyzed and their sources traced.

Connections with Minoan and Helladic gold work were less ap-

parent than affinities with the Near East, especially Syria. The sources of Syrian gold work which became important later in the Mediterranean, were found both in Sumer and in Egypt. The jeweler's art in Syria in the second millennium is a fusion of both. This hybrid Syrian craft of the time of the widest expansion of the Egyptian Empire is the true source of types, ornaments and techniques of Greek and Roman gold work. It reached Cyprus at the end of the Bronze Age, where it developed uninterruptedly through the Iron Age. At the end of the Iron Age, Attica, Crete, Rhodes, Ionia, S. Italy and Etruria were reached by Syrian commerce independently. Phenician trading-posts and workshops were probably established temporarily in Rhodes and in Etruria.

At this time Assyria played an important part in the former Egyptian Empire, and an Assyrian factor in Syro-Egyptian ornamentation is apparent.

Direct influence from Saite Egypt in the second half of the seventh century B.C., traceable in other branches of Greek art, may also be found in a few jewelry types.

From the sixth century B.C. onward, Persian types begin to penetrate into Greek jewelry. This is seen especially in the latest pieces of the treasure from the foundation of the Artemis temple in Ephesos and in the treasure found by an American expedition in Sardes.

III. The influence of Greek thought of the fifth and fourth centuries B.C. on the imagery of jewelry.

Greek jewelry, developed from types and ornaments of the orientalizing period, underwent a change in the fifth and fourth centuries. The selection of iconographical types of certain groups could be traced back to sources which also were the sources of images used by Plato: Theological speculation and the funerary art of S. Italy.

Segall, Berta, 1942. The Earring with Winged Charioteer in the Classical Department. Bull. Mus. of Fine Arts, Boston, Mass. 40: 50–54.

Hans Tietze, Metropolitan Museum of Art

Grant No. 546 (1941), $1,500. Critical catalogue of the Venetian drawings of the Fifteenth and Sixteenth centuries.

The Catalogue on which I have been working for many years in collaboration with E. Tietze-Conrat was far advanced when I

asked for a grant and received it. Only three major tasks were unfinished: (1) the completion of the collection of material, (2) the preparing of a manuscript of the Catalogue proper, (3) the writing of an introduction outlining the principles of such a critical catalogue. All three have been accomplished by the help of the grant given by the American Philosophical Society.

1. Study of all the Italian drawings and, as far as possible, all the paintings in collections in the Middle West and in the Far West. Most of the collections examined do not contain material important for our specific purpose. Two, however, the Palace of the Legion of Honor, in San Francisco, and most of all the Croker Memorial Gallery, in Sacramento, offered valuable contributions to the knowledge of Venetian drawings in the Renaissance. The collections in the Eastern States had been studied by us previously as had also those in Europe.

2. The whole manuscript has been thoroughly revised with the help of Miss Daphne Hoffman, of the Frick Art Reference Library in New York, and partly retyped, so that it is now ready to print as soon as conditions, at present highly unfavorable, make a publication possible.

3. The introduction which is likewise ready for the printer serves two purposes. It outlines the general development of drawing in Venice from its origins to the end of the classical school of painting there, which means to say, including Domenico Tintoretto and Palma Giovane who died in 1635 and 1628, respectively, and describes its specific place within a school which more than any other at the same time in Italy subordinated linear to pictorial expression. The second problem of principle with which the introduction deals is that of how far such a catalogue is altogether feasible on critical grounds. Contrary to other Italian Schools, in Venice the tradition referring to individual authors of specific drawings is almost entirely interrupted, so that the vast material handed down to us is predominantly anonymous and unconnected with other better established works. The treatment of the material by recent writers has hardly helped to disentangle it; on the contrary it made it necessary to devote much attention to the task of purifying inflated *oeuvres* before attempting to lay sounder foundations. In doing the latter we had to develop a method of our own.

Unfortunately, as said before, the manuscript, numbering around thirteen hundred typewritten pages and the eight to nine hundred illustrations, all prepared, has to wait for an opportunity of publication, no publisher at present being ready to take such a risk without a substantial financial support which we are now trying to obtain. As long as we see any hope of getting it, we prefer to keep the manuscript together rather than to break it up by making a number of separate publications in periodicals.

LITERATURE AND PHILOLOGY

FRIEDRICH WALTER LENZ, Yale University
(Member Institut de Philologie et d'Histoire Orientales et Slaves)

Grant No. 568 (1941), $300. Completion of the edition of the discourses of Aelius Aristeides and the editing of the scholia on the discourses.

A study was made on the quotations from and references to Aristeides in the commentary on the Platonic dialogue Gorgias by the Neo-Platonic philosopher Olympiodorus. Olympiodorus belongs to late antiquity as well as to the early Byzantine period. The examination of the quotations from and the references to the discourses of Aristeides shows that Olympiodorus used an exegetical edition of Aristeides' second Platonic discourse 'ὑπὲρ τῶν τεττάρων i.e., an edition of the text of Aristeides with scholia. The redaction of these scholia is reflected in the ancient scholia on this discourse which are found in those manuscripts of Aristeides, upon which a new edition of the scholia must be based. The examination of the quotations from and references to Aristeides in Olympiodorus enabled me to correct several passages of the inadequate text of Olympiodorus which is offered by the most recent edition of the Bibliotheca Teubneriana (1936). This paper has been accepted for publication in the periodical Byzantion by Professor Henri Grégoire, Director of the Institut de Philologie et d'Histoire Orientales et Slaves.

A new collation of the important Venice manuscript *Marcianus graecus 423* enabled me to correct one of the most important scholia on the second Platonic discourse of Aristeides. Because of insufficient collations this scholion, which contains an important fragment of the Greek historian Androtion, had not received its definite form up to the present time. The new constitution of the text

solves the important problem how many generals were elected by the Athenians in the era of Pericles. Now we learn that there were sometimes not nine but ten other generals besides Pericles. This observation, which is based upon the fragment of Androtion in the scholion and upon a misinterpreted passage of Thucydides, throws a new light upon the position of Pericles as commander-in-chief.

The draft of the manuscript of the edition of the ancient scholia [1] is nearing completion. To the four handwritten volumes which contain the scholia on the *Panathenaikos* four other volumes were added which contain more than three quarters of the scholia on the second Platonic discourse.

A new critical text of thirteen discourses of Aristeides out of sixteen has been established. These thirteen discourses are the *Panathenaikos* and twelve declamations on events of ancient Greek history and mythology. The constitution of the text of the three Platonic discourses which are left has been begun but not completed as yet.

LENZ, FRIEDRICH WALTER, 1941. The Athenian Strategoi in the Years 441/40 and 433/32. Trans. Amer. Phil. Assoc. 72: 226–232.

—— 1942. On the Authorship of the Leptinean Declamations Attributed to Aristides. Amer. Jour. of Philology 63: 154–173.

CHARLES GROSVENOR OSGOOD, Princeton University

Grant No. 464 (1940), $400. The Variorum Edition of Edmund Spenser's Works: Editing of all the Minor Poems of Spenser.

This edition of the Works of Spenser, first proposed by the late Edwin Greenlaw, of the Johns Hopkins University, and carried on since his death by Dean Frederick M. Padelford, Ray Heffner, and myself, has already published six volumes containing the *Faerie Queene* with full "variorum" apparatus. The present project, for which, as Special Editor, I am responsible, is the editing of Spenser's Minor Poems, with full "variorum" apparatus. These will occupy two volumes larger than any yet issued. The first of these volumes is about to appear, the second largely compiled, though not revised and checked.

The work of editing a variorum edition is twofold: (1) the preparation of a new text embodying all the help of preceding

[1] Yr. Bk. Amer. Philos. Soc. for 1940: 208, paragraph 3.

editors, and a new collation of all the early editions; (2) the assembling, appraising, sifting, arranging, and condensing, of all relevant comment, with the editor's own comment where it seems to be called for. We hope that this new text of the Minor Poems will become definitive. Certainly no other edition has included the examination of so many copies of the earliest editions. All the widely scattered material likely to elucidate the poet's meaning has been collected and weighed.

The Society's grant of $400 was spent for secretarial help in copying, checking, and arranging material, chiefly for the first volume.

MISCELLANEOUS

University of Pennsylvania for the Philadelphia Bibliographical Center and Union Library Catalogue

Charles W. David, Chairman, Executive Board

Grant No. 600 (1941), $2,000. To maintain and improve and service the Philadelphia Bibliographical Center and Union Library Catalogue, now located in the Fine Arts Building on the University Campus.

Within the past year there have been revolutionary changes in the financial support of the Union Library Catalogue and of the Philadelphia Bibliographical Center which, since September, 1940, has been operated in close cooperation with it. Although the American Philosophical Society continued its generous support of the Philadelphia Bibliographical Center to the extent of a grant of $2000, both the Carnegie Corporation of New York and the Samuel S. Fels Fund terminated the aid which has been so helpful in time past, and it has been necessary to find new assistance for this enterprise in the home territory. For the year 1942 we have been on a kind of emergency basis, using some of the accumulated surplus of earlier years and also finding generous help in the gifts of private benefactors in Philadelphia. But for 1943 and later years it was necessary to work out some more satisfactory long term program. This has been done by the Executive Board of the Center working in close cooperation with the Philadelphia Metropolitan Library Council. Acting on a suggestion which came originally from Dr. E. G. Conklin, a plan was worked out whereby it was hoped to pro-

vide regularly a minimum annual service budget of somewhat more than $5000 in the form of contributions from most of the 154 libraries, the holdings of which are now included in the Union Library Catalogue, and from a number of other institutions which make considerable use of the Catalogue, although their libraries are not included in it. The plan was completed and approved last May and it has since been put into operation with quite remarkable success. The quotas of individual institutions range from $5 for the smallest up to $750 for the largest, and, while not all of the 180 odd institutions involved have been able to meet their quotas, the great majority have done so, and a fund has been subscribed for 1943 which now stands at $5175, and it is not unlikely that some small additions may still be made to it. This is not enough to meet the whole budget of the Philadelphia Bibliographical Center and Union Library Catalogue as the joint enterprise has recently been operated, but it has been possible to supplement this sum with enough additional contributions from private benefactors so that it now appears that we shall be able to carry on our work at about the present level of efficiency at least for another year.

During 1942 the Union Library Catalogue has continued to make notable progress. Cards for new accessions have been filed to the number of 77,523, a very substantial increase over the 70,706 which were added in 1941 and the 68,500 which were added in 1940. During 1942 the scope of the Catalogue was also enlarged by two notable additions: On July 1st the Pennsylvania State College Library began contributing cards for all its new accessions and a new departure has recently been made by the addition of cards for items in the private collection of Mr. Frederic R. Kirkland which were not already known to the Union Library Catalogue. Arrangements have recently been completed for the addition of cards for new accessions to the libraries of the Philadelphia City Institute and of the Woman's Medical College, and it is our hope that after the war it will be possible to include the complete holdings of the libraries of the State College, the City Institute and the Woman's Medical College.

The most important service which is rendered at the Union Library Catalogue is without any doubt that of locating books in individual libraries for all inquirers and to set forth what has been going on here, the following statistical table is submitted:

LOCATION SERVICE

	1941	1942	% (42/41) Incr. or decr.
I. No. of inquiries:			
1. Telephone	4,206	4,627	+10.2
2. Mail	416	507	+21.9
Cooperating union catalogues	311	188	−39.4
3. Personal calls	1,255	954	−23.7
Total	6,184	6,276	+ 1.5
II. No. of items searched:			
1. Staff (general)	8,962	10,486	+17.0 } +10.4
For other union catalogues	2,772	2,437	−12.1 } +10.4
2. Personal search	22,961*	6,559	−71.5
Total	34,695*	19,482	−43.9

	1941	1942	+ or − (42/41)
III. % of items located (excl. items located from sources other than the ULC)	53.6	60.3	+6.7

	Number		%		+ or − 42/41
	1941	1942	1941	1942	
IV. Inquiries received, classified according to origin:					
1. Union catalogues	311	188	5	3	− 2
2. Libraries	2,750	3,490	44	56	+12
3. Teachers and students	1,805	1,529	29	24	− 5
4. Professionals	598	509	10	8	− 2
5. Business men and organizations	514	361	8	6	− 2
6. Others	216	199	4	3	− 1
Total	6,184	6,276	100	100	+ 1.5

* Including 8601 items of the Short Title Catalogue checked by one person.

It will be observed that notwithstanding the disturbed times in which we are living, the number of inquiries from all sources has continued to increase, though at a slower rate than formerly. There has been a decided drop in the number of inquiries from other union catalogues and from personal visitors and this has resulted in a sharp decline in the number of items searched. On the

other hand, there has been a considerable increase in the number of items searched by members of our staff, and it is gratifying to note that for items of all origins searched in the Catalogue there has been a marked increase in the percentage of successful locations. It is also interesting to note that the increased use of the Catalogue during the past year has been entirely due to the increasing number of inquiries coming from libraries. In all other categories there has been a decline which is doubtless to be accounted for by the war.

Some of the activities of the Bibliographical Center have been of considerable interest. One of the most significant was the experiment in centralized coöperative cataloguing which was made in the spring with WPA assistance in connection with a War Documentation Center. Unfortunately, the project ended abruptly on July 1st, not because it was unsuccessful from a technical standpoint (for indeed it was a real success), but because the WPA project on which it was dependent was suddenly terminated by federal authority. The modest duplicate book exchange which was also started in the spring has proved to be a real success and it would be gratifying indeed if it should be the first step in a far reaching move which may ultimately lead to the exchange of whole collections between one library and another in the interest of a more logical distribution of holdings and a greater specialization.

Finally, it should be noted that through an arrangement with the University of Pennsylvania, the extensive Bibliography of American Literature is now housed at the Bibliographical Center and Union Library Catalogue. Begun as a WPA project and housed by the University of Pennsylvania, it is now principally in charge of its Editor, Mr. Edward H. O'Neill, who enjoys a stipend from the American Philosophical Society and who is going on with the work on the Bibliography as best he may until such time as it may be possible to resume operations on a large scale again after the war.

David, Charles W., 1942. Library Planning in Philadelphia. Two editions (Jan., Feb.).

Philadelphia Bibliographical Center and Union Library Catalogue, 1942. Check List of Desiderata 2: No. 4 (regular series suspended for the duration).

—— 1942. Check List of Desiderata. Special issue, No. 1 Nibelungenlied List.

—— 1942. Committee on Exhibits, Bull. No. 1.

—— 1942. News Letter, Nos. 7–10.
—— 1942. Committee on Exchange. Program of Action for Operation of Exchange.
—— 1942. Committee on Exchange. Exchange List, Nos. 1–3.
—— 1942. Committee on Microphotography. Union List of Microfilms; a basic list of holdings in the United States and Canada. Phila.
—— 1942. War Documentation Center. Directory of Agencies.

The following items not in any part financed by the American Philosophical Society should be noted:

Bibliographical Planning Committee of Philadelphia. Philadelphia Libraries; a survey of facilities, needs, and opportunities. Phila., 1942.
Downs, Robert B., ed. Union Catalogs in the United States. Chicago, American Library Association, 1942. Contains: Manual of Union Catalog Administration and Directory of Union Catalogs in the United States, by Arthur B. Berthold.

6. REPORT OF THE COMMITTEE ON FINANCE

According to the Laws of the Society, the Committee on Finance consists of the President and the Treasurer, *ex-officio*, and not fewer than five other members who shall be nominated by the President and elected by the Society at the General Meeting in April.

Chapter V, Articles 3 and 4 of the Laws read:

"The Committee on Finance shall have the general superintendence of the financial concerns of the Society. It shall have the custody and control of all the securities and investments of the Society, both real and personal, with full power and authority to buy and to sell, and to invest and reinvest the same; including the power to purchase and to sell real estate and to make leases thereof, to satisfy mortgages and extinguish ground rents, and to direct the placing of all such insurances as it may deem necessary; as well as to borrow on the credit of the assets of the Society, to create mortgages thereon, and to make such improvements, repairs and alterations to real estate as it may deem necessary. It shall have power to authorize the proper Officers of the Society to execute the necessary papers to effect all purchases, sales and assignments of property, both real and personal; to execute and to satisfy mortgages, to extinguish ground rents and to transfer registered securities; to subscribe to bond-holders' agreements to plans of reorganization involving any securities held by the Society or in which it has an interest, and to do all such acts as are necessary in pursuance of the foregoing powers.

"The Committee on Finance shall always have access to the Treasurer's books, accounts, and vouchers, and shall cause an audit of such accounts to be made at least once a year. It shall require from the Treasurer an annual report of all the operations of the treasury, which it shall present to the Council with an annual statement of estimates of receipts and expenditures. With the approval of the Council it shall determine the fiscal year of the Society and, in case of emergency needs, authorize appropriations over and above the annual budget."

During the year 1942–43, the Committee on Finance consisted of Marshall S. Morgan, *Chairman*, Morris Duane, Thomas S. Gates,

Edward Hopkinson, Jr., John Story Jenks, Charles J. Rhoads, J. Henry Scattergood, Roland S Morris, and Edwin G Conklin, *President*. Luther P. Eisenhart, *Executive Officer*, sat with the Committee.

The members of the Committee meet regularly once a month from January to June and from October to December with occasional special meetings.

REPORT OF THE TREASURER

General and Special Funds

There are twenty-three funds in the keeping of the Society. Only five of these are unrestricted in the uses to which their income may be applied "for promoting useful knowledge"; three specify a primary purpose, after which any balance may be used for general purposes; fifteen are restricted to specific uses, eleven of these being for the purchase of books for the Library. These funds and the manner and purpose of their establishment are listed alphabetically below.

Associated Fund

Created as of December 31, 1939, in accordance with a resolution adopted by the Committee on Finance, December 5, 1939, with the approval of Legal Counsel. All assets held in the Balch International Law Library, Boyé Library, Brush Endowment, Carlier Library, Franklin Library, Jefferson Library, Lewis, Magellanic, Michaux, Norris Library, Phillips Library, Proud Library, Seybert Library, Tilghman Library, and Whitfield Funds, have been transferred to the Associated Fund at their market value, and each contributing fund has been assigned a proportionate interest in the Associated Fund based on the value of assets contributed.

Balch International Law Library Fund

Founded by Thomas Willing Balch, Esq., of Philadelphia, October 13, 1911, with an initial gift of securities valued at about $700, increased by later gifts to about $1,600, as a memorial to his father for his part in bringing about the submission of the Alabama Claims to the Geneva Tribunal. A part of the income to be used for the purchase of books relating to the law of nations

and such other uses, when thought advisable, as may promote the study of that science; a part, not less than one-half, to be added annually to the principal.

Boyé Library Fund

Bequest of $1,879.21 by Professor Martin Boyé, of Coopersburg, Pa., who died March 5, 1909. By resolution of the Society, December, 1910, the income to be expended in the purchase of books, preferably on chemistry and geology.

Brush Endowment Fund

Gift of $10,000 by Charles Francis Brush, LL.D., of Cleveland, Ohio, November 24, 1914. Income to be used for the general purposes of the Society.

Building Fund

Created by deed of trust dated June 4, 1900, Girard Trust Company, depositary and trustee. All money or property which shall be designated or devoted by any donor, testator or other person, for the acquisition of land or buildings for the Society's use, shall be forthwith paid over, conveyed, or delivered by the Society to the said depositary, for the acquisition of land and the construction and furnishing of buildings for the use and occupation of the Society. The present value is $635,185.59.

Carlier Library Fund

Bequest of $5,000 by Auguste Carlier, of Paris, who died March 16, 1890. The income, less 10 per cent which is to be added to the principal, is to be expended for the purchase of books for the Library.

Carnegie Library Fund

Gift of $100,000 by the Carnegie Corporation in 1931. The income to be used for the maintenance of the Library.

Daland Fund

Bequest of the residuary estate of Dr. Judson Daland, of Philadelphia, who died August 14, 1937, approximately $220,000. The income, less 10 per cent which is to be added annually to the principal, to be used by the Society for research in clinical medicine.

FRANKLIN LIBRARY FUND

Established by the Library Committee in May, 1911, from funds derived from the proceeds of the sale in that year of duplicates, formerly the property of Benjamin Franklin, approximately $3,400. The income to be used for the purchase of books.

GENERAL FUND

This fund has been accumulated from various sources through many years; its income is available for the general purposes of the Society.

JEFFERSON LIBRARY FUND

Established by the Library Committee on January 20, 1905, from the proceeds of royalties from the publication of manuscripts acquired by the Society through President Thomas Jefferson, approximately $1,700. Income to be used for the purchase of books.

JOHNSON FUND

Established in 1937 when Mr. Eldridge Reeves Johnson removed the restriction on his gift of $500,000 and changed it to General Endowment until 1957, unless prior thereto Mr. Johnson directs that it be used for some other purpose of the Society. After 1957 it is to become an unrestricted gift. All income to be used for the general purposes of the Society.

LEWIS FUND

Gift of $10,000 made by Mrs. John F. Lewis in 1935 in memory of her husband; the income to be used each year as an award to the American citizen who shall announce at any general or special meeting of the Society, and publish among its papers, some truth which the Council of the Society shall deem worthy of the award. In any year income not so awarded to be added to principal.

MAGELLANIC FUND

Gift of 200 guineas by John Hyacinth de Magellan, of London, in 1786, for a gold medal to be annually awarded under prescribed terms, to the author of the best discovery or most useful invention relating to navigation, astronomy, or natural philosophy (mere natural history only excepted). Any surplus of interest

remaining to be used for such purposes as may be authorized under the Society's Charter and Laws. By resolution of the Society, December, 1899, the unexpended annual income, less 10 per cent which is to be added to the principal, may be used for the purchase of books relating to those departments of science in which the premium is annually offered.

MICHAUX FUND

Bequest of 92,600 francs by François André Michaux, who died at Vaureal, France, October 23, 1855; for the extension and progress of agriculture, and more especially of sylviculture, in the United States. By resolution of the Society, March, 1899, the income, less 10 per cent reserved for investment, to be used for the purchase of books on forestry, etc.

NORRIS LIBRARY FUND

Established by the Library Committee in May, 1911, from the proceeds of the sale in that year of duplicate pamphlets, presented to the Society in 1815 by Joseph Parker Norris, Esq., of Philadelphia, approximately $2,100. Income to be used for the purchase of books.

PHILLIPS LIBRARY FUND

Bequest of his residuary estate, approximately $3,410 (December, 1895), by Henry Phillips, Jr., Esq., of Philadelphia, who died June 6, 1895, to which were later added two bequests to him, confirmed and audited October 5, 1903, of $7,547.54 from the estate of his aunt, Emily Phillips, and of $42,315.80, being an interest in the residuary estate of his uncle, Henry M. Phillips. Income to be used for the purchase of books on archaeology and philology in accordance with the terms of the bequest.

PHILLIPS PRIZE ESSAY FUND

The gift on October 5, 1888, of $5,000 by Miss Emily Phillips, of Philadelphia, in memory of her brother Henry M. Phillips. Income to be used in the awarding of a prize for the best essay of real merit on the science and philosophy of jurisprudence.

PENROSE FUND

Bequest of one-half of the residuary estate of Dr. Richard A. F. Penrose, Jr., of Philadelphia, who died July 31, 1931,

approximately $3,900,000; by the terms of the bequest this gift to be considered an endowment fund, the income of which only is to be used and the capital to be properly invested.

PROUD LIBRARY FUND

Established by the Library Committee in May, 1911, from the proceeds of the sale in that year of duplicate pamphlets presented in 1812 by Robert Proud, Esq., of Philadelphia, $2,500. Income to be used for the purchase of books.

SEYBERT LIBRARY FUND

Bequest of $2,000 by Henry Seybert, Esq., of Philadelphia, who died March 3, 1883. By resolution of the Society, November, 1909, the income to be expended for the purchase of books.

TILGHMAN LIBRARY FUND

Bequest of $200 by Chief Justice William Tilghman, of Philadelphia, who died April 30, 1827. Income to be expended for the purchase of books.

WHITFIELD FUND

Bequest of the residuary estate of James Edward Whitfield of Philadelphia, who died November 4, 1930; approximately $42,000. This fund was left "absolutely and in fee." Ten per cent of the income will be added to principal annually and the balance applied to general purposes of the Society.

WOOD MEMORIAL FUND

Bequest of the residuary estate of Walter Wood, of Philadelphia, who died April 20, 1934, approximately $150,000, in memory of his uncle, George B. Wood, his cousin, Horatio G. Wood, and his two brothers, Richard and Stuart Wood, all of whom were members of the American Philosophical Society; to be used by the Society first for the construction of a building that shall be adequate for the needs of the Society and if there be any surplus, then the same to be applied to such useful purpose or purposes as the Counsel (sic) and Officers of said Society may determine.

Budget for 1943

Estimated Income

Unrestricted Funds		
General	$ 34,112.50	
Charles Francis Brush Endowment	453.40	
Johnson Endowment	21,245.00	
Richard A. F. Penrose, Jr., Endowment	140,610.40	
Whitfield	1,800.00	
		$198,221.30
Semi-Restricted Funds		
Magellanic	$ 224.56	
François André Michaux	2,137.14	
Wood Memorial	10,315.25	
		$ 12,676.95
Restricted Funds		
A. *Library Funds*		
Thomas Balch International Law	$ 185.94	
Martin Boyé	135.73	
Auguste Carlier	564.15	
Carnegie Library	3,000.00	
Benjamin Franklin	400.20	
Thomas Jefferson	150.70	
Joseph Parker Norris	187.58	
Henry Phillips, Jr.	3,676.80	
Robert Proud	229.85	
Henry Seybert	154.03	
William Tilghman	81.92	
		$ 8,766.90
B. *Special Funds* [1]		
Judson Daland	$ 7,743.00	
John F. Lewis Prize	409.70	
Henry M. Phillips Prize Essay	472.75	
		$ 8,625.45
Sales of Publications		2,000.00
		$230,290.60

[1] See Schedule VIII for Building Fund.

ESTIMATED EXPENSES

Executive Office	$ 8,000.00	
Secretaries' Expense	2,500.00	
Telephone	500.00	
Insurance	2,000.00	
Committee on Publications:		
Publication Expense	17,000.00	
Publication—Salaries	6,000.00	
Committee on Library:		
Books and Binding	7,000.00	
Librarians' Salaries	10,200.00	
Rental for Housing of Library	9,300.00	
Treasurer's Expense	10,000.00	
Hall Fund	2,500.00	
Committee on Research:		
Penrose Fund	75,000.00	
Johnson Fund	19,000.00	
Daland Fund	8,000.00	
Research Expense (Penrose Fund)	1,000.00	
Meetings	7,000.00	
Pensions	2,800.00	
Miscellaneous	10,000.00	
		$ 197,800.00

Balances carried forward from 1942 to pay appropriations made under the 1942 budget:		
Books and Binding	$ 4,274.32	
Publication Expenses	29,083.35	
World-wide Broadcasting Foundation	12,554.83	
Research Fund (Penrose Fund)	71,778.77	
Research Fund (Johnson Fund)	16,215.76	
Research Fund (Daland Fund)	2,920.00	
		$ 136,827.03

The total book value of the investments and cash held as Principal as shown by the Accountants' report is:

Unrestricted Funds	$5,796,117.85	
Semi-Restricted Funds	731,657.90	
Restricted Funds	469,460.56	
Building Fund	635,185.59	
		$7,632,421.90

The following report of our Certified Public Accountants shows income and disbursements in accordance with the method heretofore followed. The income from funds known as "Restricted" which are applied to specific purposes is separately recorded in Schedule III. The income from the Wood Fund Personalty and the Wood Fund Real Estate is shown in Schedules IV and V; this income, from the Wood Funds, has heretofore been used to reduce indebtedness incurred in connection with settling certain obligations of the Wood Estate. These have now been paid in full. During the coming year the income will be temporarily added to principal as a fund to provide for unusual maintenance or development of the real estate. The income from the Building Fund, of which the Girard Trust Company is Trustee, is added to principal, in accordance with the trust agreement establishing this fund, except insofar as is required to maintain the Hall. Contributions received from the Carnegie Corporation for Investigation on Methods and Results of Adult Education in Science are kept in a separate account. All other income and all other expenses are consolidated into the General Fund (see Schedule I) so that that Fund, in effect, sets forth the operating income and disbursements of the Society.

During the past year the receipts from the General Fund were

Balance 1/1/42	$ 8,498.57	
Income (Consolidated)	223,916.75	
		$232,415.32
Disbursements (Consolidated)		165,638.59
Balance		$ 66,776.73
To increase the income of the Society, $65,000 has been taken from the unexpended appropriations for temporary investment, the investments being added to the principal of the General Fund		65,000.00
Balance		$ 1,776.73

Respectfully submitted,

FIDELITY-PHILADELPHIA TRUST COMPANY,
TREASURER,
MARSHALL S. MORGAN, *President*.

REPORT OF THE CERTIFIED PUBLIC ACCOUNTANTS

LINVILL & PARRY

Certified Public Accountants

Twelve South Twelfth Street, Philadelphia

February 15, 1943

DR. EDWIN G. CONKLIN, *President,*
The American Philosophical Society,
Philadelphia, Pennsylvania

Dear Sir:

GENERAL AND TRUST FUNDS

We have examined the accounts of the American Philosophical Society for the year ended December 31, 1942, as contained in the records of the Treasurer, the Fidelity-Philadelphia Trust Company. The appended statements, Schedules I to VII inclusive, are in accordance with these records.

We have examined paid cancelled checks and vouchers in connection with disbursements in the various funds except the Wood Fund Real Estate Income Account, as to which we have accepted the cash records of the Fidelity-Philadelphia Trust Company as agent, without any further examination. The cash in bank at December 31, 1942, as summarized in Schedule VI, has been verified.

We have examined into the changes during the year in the investments in all of the funds. We examined the perpetual and other fire insurance policies carried as an investment in the General Fund, and obtained detailed statements from the Fidelity-Philadelphia Trust Company, the Girard Trust Company, and The Pennsylvania Company, etc., showing at December 31, 1942, the bonds, stocks, real estate and other investments held by them as agents or trustees for the Society, thus satisfactorily accounting for all of the investments of the Society as called for by the records at December 31, 1942.

The investments composing the various funds at December 31, 1942, as summarized in the appended statement (Schedule VII) are at book value, which, in all funds except the Associated Fund, is as follows: Bonds and Mortgages at par or face value to January 1, 1940, and at par or cost, whichever is lower, for subsequent purchases; Stocks at cost when purchased or at inventory value when received as gifts or bequests; and Real Estate at amount of fore-

closed mortgage plus costs of acquisition and subsequent improvements, and appraised or assessed value when acquired as gifts or devises. The Associated Fund investments are at December 31, 1942 market values. We have not determined the current market value of any of the other investments of the Society.

Income due for the year from the investments has been received and recorded on the books prior to December 31, except as follows:

General and Other Trust Funds:	
Interest in default, Philadelphia and Reading Coal & Iron Co. Bonds, including $1,125.00 in default January 1, 1942	$1,375.00
(Received $425.00 on account during Jan. 1943)	
Mutual Assurance Company Dividend	30.00
(Received during January 1943)	
Mortgage Interest (satisfied mortgage)	25.00
Carnegie Library Fund:	
Delinquent Mortgage Interest	1,816.67
(Including $1,341.67 in default Jan. 1, 1942)	
	$3,246.67

We do not list as in arrears, deferred interest originally due from May 1, 1939 to November 1, 1940 inclusive, on issues of the Lehigh Valley Railroad Company, which issues are subject to extension plan and agreement, dated August 25, 1938, under which 75 per cent of the interest has been deferred and only 25 per cent paid.

Comprehensive tests have been made of the income receivable from other sources, except as to real estate, for which we have not examined leases, rental statements or other data in connection with income recorded as being received.

Building Fund

Girard Trust Company, Trustee

We have examined statements submitted by the Girard Trust Company, Trustee, of the Building Fund for the year ended December 31, 1942, have examined the records in the Society's office of subscriptions or pledges to the fund, and have prepared the appended statement of Cash Receipts and Disbursements and Summary of the Assets for the year—Schedules VIII and IX.

The cash and investments are in accordance with a statement obtained by us from the Girard Trust Company, Trustee, setting forth in detail the assets in their possession at December 31, 1942. All of the investments are at par value except stocks, which are at cost, with real estate (participations) at amount of foreclosed mortgage plus costs of acquisition and subsequent improvements. We have not determined the present value of any of the investments, or the collectibility of the unpaid pledges to the fund.

We have examined into the changes during the year in the investments, and have accounted for all income due except delinquent mortgage interest $6,926.74, of which amount $4,709.76 was delinquent January 1, 1942. As explained under General and Trust Funds, we do not list as in arrears interest deferred on bonds of Lehigh Valley Railroad Company.

Respectfully submitted,

LINVILL & PARRY,

Certified Public Accountants.

SCHEDULE I

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

General Fund

Principal Account

Balance, January 1, 1942			$ 13,725.71
Receipts:			
Investments Sold or Redeemed:			
U. S. Government Bonds ($95,000.00)		$ 95,812.50	
Preferred Stocks		49,047.93	
Common Stocks		59,134.47	
On Account of Mortgages		550.00	
Fine Arts All Risks Insurance (one year's charge)		1,205.30	
Transferred from Income Account, net		65,000.00	
			270,750.20
			$284,475.91
Disbursements:			
Investments Purchased:			
U. S. Government Bonds ($150,000.00)		$150,000.00	
Industrial Bonds ($50,000.00)		48,869.44	
Preferred Stocks		19,397.63	
Common Stocks		59,160.12	
Perpetual Fire Insurance Policies		240.00	
			277,667.19
Balance, December 31, 1942			$ 6,808.72

Income and Operating Account

Balance, January 1, 1942			$ 8,498.57
Receipts:			
Income from Investments		$ 37,354.14	
Girard Trust Company Building Fund Reimbursement for alterations and furnishing of Society's building, etc.		5,132.09	
Sale of Publications		1,314.06	
Royalties on W. B. Scott's book, "History of Land Mammals in the Western Hemisphere"		213.26	
The Henry LaBarre Jayne Lecture Foundation		200.00	
Contributions for Research:			
Dr. Henry Winsor	$ 1,000.00		
Mrs. Sol. Rothschild	600.00		
		1,600.00	
Sale of Microfilms		79.80	
Refunds—Penrose Research Fund Grants	$ 1,622.82		
Johnson Research Fund Grants	10.76		
		1,633.58	
Transfer of Income from Trust Funds:			
Richard A. F. Penrose, Jr., Endowment Fund	$146,901.32		
Johnson Endowment Fund	19,000.00		
Judson Daland Fund	8,000.00		
Carnegie Library Fund	2,067.46		
Charles F. Brush Endowment Fund	421.04		
		176,389.82	
			223,916.75
Amount forwarded			$232,415.32

Brought forward			$232,415.32
Disbursements:			
Salaries—Executive Office		$ 10,216.50	
Salaries and Pension—Librarian and Assistant Librarians		9,337.04	
Secretaries' Expenses		2,063.13	
Telephone		591.98	
Publication Expenses		17,019.72	
Committee on Conservation of Cultural Resources		295.49	
Independence Hall Association		50.00	
Books and Binding		7,035.66	
Camera Expenses		519.14	
Insurance		3,091.80	
Meetings		5,978.93	
Hall Expenses		3,078.88	
Hall Equipment, Alterations and Furnishings		5,462.44	
Library Rental (Drexel Building)		9,200.00	
Investment Counsel Fees		2,500.00	
Auditing Fees		925.00	
Legal Expense		785.32	
Treasurer's Expense		48.50	
World-wide Broadcasting Foundation		12,445.17	
Research Fund Grants:			
Wistar Institute (Henry Winsor Contribution)	$ 1,000.00		
Penrose Fund	55,330.30		
Johnson Fund	10,225.00		
Daland Fund	6,810.00		
		73,365.30	
Research Expenses		680.02	
Insurance, Postage, etc.		11.33	
Treasurer's Commissions	$ 6,874.97		
Agent's Commission (Girard Trust Company, Carnegie Fund)	195.99		
	$ 7,070.96		
Charged Other Funds	6,133.72		
		937.24	
Transfer to Principal Account, net		65,000.00	
			230,638.59
Balance, December 31, 1942—General Fund			$ 1,776.73

COMMITTEE ON EDUCATION AND PARTICIPATION IN SCIENCE

Grant from Carnegie Corporation of New York

Balance Unexpended January 1, 1942	$ 9,730.17	
Receipts:		
Sale of Pamphlets	18.72	
	$ 9,748.89	
Expended	3,380.88	
Balance Unexpended, December 31, 1942		6,368.01
Total		$ 8,144.74

Note:

The following General Fund appropriations for 1942 balances are carried forward:

Books and Binding		$ 4,274.32
Publication Expenses		29,083.35
World-wide Broadcasting Foundation		12,554.83
Research Fund:		
Penrose Fund	$71,778.77	
Johnson Fund	16,215.76	
Daland Fund	2,920.00	
		90,914.53
Total General Fund appropriations for 1942 balances carried forward		$136,827.03

SCHEDULE II

SUMMARY OF CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

TRUST FUNDS—PRINCIPAL ACCOUNT*

	Balance 1-1-1942	Receipts: Proceeds from Investments Sold or Matured	Receipts: Transferred from or *to* Income Account	Receipts: Distribution from Estates	Receipts: Total	Disbursements: Investments Purchased	Disbursements: Miscellaneous	Disbursements: Transferred to Associated Fund	Disbursements: Total	Balance 12-31-42
Unrestricted Funds:										
Johnson Endowment	$ 2,240.66	$ 72,614.34	$2,320.14	—	$ 77,175.14	$ 74,123.57	$ .28	—	$ 74,123.85	$ 3,051.29
Richard A. F. Penrose, Jr., Endowment	1,394.78	677,094.42	*703.83*	—	677,785.37	648,898.74	18.00	—	648,916.74	28,868.63
Whitfield	—	7,332.54	224.80	*$95.36*	7,461.98	7,000.00	—	$ 461.98	7,461.98	—
	$ 3,635.44	$757,041.30	$1,841.11	*$95.36*	$762,422.49	$730,022.31	$18.28	$ 461.98	$730,502.57	$31,919.92
Semi-restricted Funds:										
Magellanic	—	—	$ 21.41	—	$ 21.41	—	—	$ 21.41	$ 21.41	—
François André Michaux	—	—	203.80	—	203.80	—	—	203.80	203.80	—
	—	—	$ 225.21	—	$ 225.21	—	—	$ 225.21	$ 225.21	—
Restricted Funds:										
Library Funds:										
Thomas Balch International Law	—	—	$ 88.66	—	$ 88.66	—	—	$ 88.66	$ 88.66	—
Martin Boyé	—	—	12.94	—	12.94	—	—	12.94	12.94	—
Auguste Carlier	—	—	53.80	—	53.80	—	—	53.80	53.80	—
Carnegie Library	$ 4,629.44	$ 1,096.18	—	—	5,725.62	$ 5,577.11	—	—	5,577.11	$ 148.51
Benjamin Franklin	—	—	38.16	—	38.16	—	—	38.16	38.16	—
Thomas Jefferson	—	—	14.37	—	14.37	—	—	14.37	14.37	—
Joseph Parker Norris	—	—	17.89	—	17.89	—	—	17.89	17.89	—
Henry Phillips, Jr.	—	—	350.62	—	350.62	—	—	350.62	350.62	—
Robert Proud	—	—	21.91	—	21.91	—	—	21.91	21.91	—
Henry Seybert	—	—	14.69	—	14.69	—	—	14.69	14.69	—
William Tilghman	—	—	7.81	—	7.81	—	—	7.81	7.81	—
	$ 4,629.44	$ 1,096.18	$ 620.85	—	$ 6,346.47	$ 5,577.11	—	$ 620.85	$ 6,197.96	$ 148.51
Special Funds:										
Judson Daland	2,584.67	70,285.48	768.13	—	73,638.28	72,454.60	—	—	72,454.60	1,183.68
John F. Lewis Prize	—	—	39.07	—	39.07	—	—	39.07	39.07	—
Henry M. Phillips Prize Essay	216.90	—	47.84	—	264.74	—	—	—	—	264.74
	$ 7,431.01	$ 71,381.66	$1,475.89	—	$ 80,288.56	$ 78,031.71	—	$ 659.92	$ 78,691.63	$ 1,596.93
Transferred to Associated Fund	—	—	*$1,347.11*	—	*$ 1,347.11*	—	—	*$1,347.11*	*$ 1,347.11*	—
Associated Fund	$ 1,753.79	$ 35,576.14	$1,347.11	—	$ 38,677.04	$ 36,749.20	—	—	$ 36,749.20	$ 1,927.84
Totals	$12,820.24	$863,999.10	$3,542.21	*$95.36*	$880,266.19	$844,803.22	$18.28	—	$844,821.50	$35,444.69

* Exclusive of: Wood Fund—See Schedules IV and V. Building Fund—See Schedules VIII and IX.

SCHEDULE III

SUMMARY OF CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

TRUST FUNDS—INCOME ACCOUNT*

		Receipts			Disbursements					
	Balance 1-1-1942	Gross Income from Investments	Distribution from Estates	Total	For Purpose of Fund	Treasurer's and Agent's Commissions and Miscellaneous	Transferred to General Fund	Transferred to or *from* Principal Account	Total	Balance 12-31-42
Unrestricted Funds:										
Charles Francis Brush Endowment	——	$ 421.04†	——	$ 421.04	——	——	$ 421.04	——	$ 421.04	——
Johnson Endowment	$16,886.12	23,111.49	——	39,997.61	——	$ 591.90	19,000.00	$2,320.14	21,912.04	$18,085.57
Richard A. F. Penrose, Jr., Endowment	——	150,122.99	——	150,122.99	——	3,925.50	146,901.32	*703.83*	150,122.99	——
Whitfield	——	1,157.66	$1,089.99	2,247.65	——	28.96	——	224.80	253.76	1,993.89
	$16,886.12	$174,813.18	$1,089.99	$192,789.29	——	$4,546.36	$166,322.36	$1,841.11	$172,709.83	$20,079.46
Semi-restricted Funds:										
Magellanic	$ 600.80	$ 208.54†	——	$ 809.34	*$ 2.80*	——	——	$ 21.41	$ 18.61	$ 790.73
François André Michaux	5,362.35	1,984.77†	——	7,347.12	243.61	——	——	203.80	447.41	6,899.71
	$ 5,963.15	$ 2,193.31	——	$ 8,156.46	$ 240.81	——	——	$ 225.21	$ 466.02	$ 7,690.44
Restricted Funds:										
Library Funds:										
Thomas Balch International Law	$ 455.73	$ 172.69†	——	$ 628.42	——	——	——	$ 88.66	$ 88.66	$ 539.76
Martin Boyé	491.52	126.04†	——	617.56	$ 11.69	——	——	12.94	24.63	592.93
Auguste Carlier	1,220.11	523.92†	——	1,744.03	871.61	——	——	53.80	925.41	818.62
Carnegie Library	——	6,532.88	——	6,532.88	——	$4,465.42	$ 2,067.46	——	6532.88	——
Benjamin Franklin	560.06	371.65†	——	931.71	307.22	——	——	38.16	345.38	586.33
Thomas Jefferson	371.63	139.95†	——	511.58	26.58	——	——	14.37	40.95	470.63
Joseph Parker Norris	443.42	174.20†	——	617.62	54.22	——	——	17.89	72.11	545.51
Henry Phillips, Jr.	5,835.89	3,414.68†	$ 28.20	9,278.77	378.17	——	——	350.62	728.79	8,549.98
Robert Proud	680.40	213.41†	——	893.81	108.61	——	——	21.91	130.52	763.29
Henry Seybert	493.26	143.05†	——	636.31	26.67	——	——	14.69	41.36	594.95
William Tilghman	179.33	76.08†	——	255.41	——	——	——	7.81	7.81	247.60
	$10,731.35	$ 11,888.55	$ 28.20	$ 22,648.10	$1,784.77	$4,465.42	$ 2,067.46	$ 620.85	$ 8,938.50	$13,709.60
Special Funds:										
Judson Daland	9,876.62	7,681.33	——	17,557.95	——	203.60	8,000.00	768.13	8,971.73	8,586.22
John F. Lewis Prize	458.88	380.47†	——	839.35	——	——	——	39.07	39.07	800.28
Henry M. Phillips Prize Essay	2,056.82	478.41	——	2,535.23	1,510.00	11.96	——	47.84	1,569.80	965.43
	$23,123.67	$ 20,428.76	$ 28.20	$ 43,580.63	$3,294.77	$4,680.98	$ 10,067.46	$1,475.89	$ 19,519.10	$24,061.53
Associated Fund	——	$ 223.86†	——	$ 223.86	——	$ 223.86	——	——	$ 223.86	——
Totals	$45,972.94	$197,659.11	$1,118.19	$244,750.24	$3,535.58	$9,451.20	$176,389.82	$3,542.21	$192,918.81	$51,831.43

* Exclusive of: Wood Fund—See Schedules IV and V. Building Fund—See Schedules VIII and IX.

† Income from Investments—Associated Funds Total $8,574.35.

SCHEDULE IV

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

Wood Fund—Personalty

Principal Account

Balance, January 1, 1942		$ 841.44
Receipts:		
Investments sold or redeemed	$2,348.90	
Transfer from Wood Fund—Personalty Income Account	6,350.26	
Mortgage Satisfaction Fee	10.00	
		8,709.16
		$9,550.60
Disbursements:		
Mortgage Satisfaction Fee		10.00
Balance, December 31, 1942		$9,540.60

Income Account

Balance, January 1, 1942		$1,241.47
Receipts:		
Income from Investments		5,380.83
		$6,622.30
Disbursements:		
Treasurer's Commission	$ 269.04	
Transferred to Wood Fund—Personalty Principal Account	6,350.26	
Fee for information on Mortgage Bondsmen	3.00	
		$6,622.30
Balance, December 31, 1942		—

SCHEDULE V

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

WOOD FUND—REAL ESTATE

Principal Account

Balance, January 1, 1942		$ 27.32
Receipts:		
Transferred from Wood Fund—Real Estate Income Account	$11,408.45	
Sale of Snedeker Farm in Mercer County, N. J.	750.00	
Deposit—Account of sale of Crawford Property, Bucks County, Pa.	600.00	
		12,758.45
		$12,785.77
Disbursements:		
Commission on Real Estate Sales	$ 114.50	
Expenses re sale of Real Estate	23.80	
Appraisal — 28–42 S. 16th Street	75.00	
		213.30
Balance, December 31, 1942		$12,572.47

Income Account

Balance, January 1, 1942		$ 6,314.88
Receipts:		
Income from Real Estate	$44,789.46	
Adjustment and Cancellation of Insurance	.97	
Refund of Taxes	1.51	
Miscellaneous	18.69	
		44,810.63
		$51,125.51
Disbursements:		
Taxes on Real Estate	$13,527.91	
Water Rents	465.68	
Maintenance, Repairs and Insurance	24,816.84	
Expense re sale of Davidson Kennedy Farm	11.10	
Fee for Assessment Reduction	164.22	
Treasurer's Commission	731.31	
Transferred to Wood Fund—Real Estate Principal Account	11,408.45	
		$51,125.51
Balance, December 31, 1942		—

SCHEDULE VI

SUMMARY OF CASH

December 31, 1942

	Principal	Income	Total
Unrestricted Funds:			
General	$ 6,808.72	$ 8,144.74	$ 14,953.46
Johnson Endowment	3,051.29	18,085.57	21,136.86
Richard A. F. Penrose, Jr.	28,868.63	——	28,868.63
Whitfield	——	1,993.89	1,993.89
	$38,728.64	$28,224.20	$ 66,952.84
Semi-Restricted Funds:			
Magellanic	——	$ 790.73	$ 790.73
François André Michaux	——	6,899.71	6,899.71
Wood Memorial:			
Personalty	$ 9,540.60	——	9,540.60
Real Estate	12,572.47	——	12,572.47
	$22,113.07	$ 7,690.44	$ 29,803.51
Restricted Funds:			
Library Funds:			
Thomas Balch International Law	——	$ 539.76	$ 539.76
Martin Boyé	——	592.93	592.93
Auguste Carlier	——	818.62	818.62
Carnegie Library	$ 148.51	——	148.51
Benjamin Franklin	——	586.33	586.33
Thomas Jefferson	——	470.63	470.63
Joseph Parker Norris	——	545.51	545.51
Henry Phillips, Jr.	——	8,549.98	8,549.98
Robert Proud	——	763.29	763.29
Henry Seybert	——	594.95	594.95
William Tilghman	——	247.60	247.60
	$ 148.51	$13,709.60	$ 13,858.11
Special Funds:			
Judson Daland	1,183.68	8,586.22	9,769.90
John F. Lewis Prize	——	800.28	800.28
Henry M. Phillips Prize Essay	264.74	965.43	1,230.17
	$ 1,596.93	$24,061.53	$ 25,658.46
Associated Fund	$ 1,927.84	——	$ 1,927.84
Totals	$64,366.48	$59,976.17	$124,342.65

On deposit with Fidelity-Philadelphia Trust Company (Treasurer's Account)	$ 59,976.17
Included among the Trust Funds (Cash) of Fidelity-Philadelphia Trust Co.	64,217.97
Included among the Trust Funds (Cash) of Girard Trust Company (Carnegie Library Fund)	148.51
	$124,342.65

SCHEDULE VII

GENERAL AND SPECIAL FUNDS

PRINCIPAL

December 31, 1942

	Uninvested Cash 12-31-1942	Invested 12-31-1942	Total Funds at Book Value 12-31-1942	Total Funds at Book Value 12-31-1941
Unrestricted Funds:				
General	$ 6,808.72	$ 950,455.18	$ 957,263.90	$ 884,624.92
Johnson Endowment	3,051.29	519,304.92	522,356.21	518,765.83
Richard A. F. Penrose, Jr., Endowment	28,868.63	4,232,495.01	4,261,363.64	4,243,974.22
Total Unrestricted Funds	$38,728.64	$5,702,255.11	$5,740,983.75	$5,647,364.97
Semi-Restricted Funds:				
Wood Memorial:				
Personalty	$ 9,540.60	$ 106,316.40	$ 115,857.00	$ 109,657.84
Real Estate	12,572.47	545,906.00	558,478.47	547,963.32
For the construction of a building adequate to the needs of the Society, any surplus remaining to be applied to such useful purpose as counsel and officers of Society may determine				
Total Semi-Restricted Funds	$22,113.07	$ 652,222.40	$ 674,335.47	$ 657,621.16
Restricted Funds:				
Library Fund:				
Carnegie Library				
For maintenance of Library	$ 148.51	$ 100,011.56	$ 100,160.07	$ 100,160.07
Henry Phillips, Jr. (See Associated Fund for additional $89,242.11 in Fund)		491.53*	491.53	491.53
Special Funds:				
Judson Daland				
For research in Clinical Medicine	1,183.68	204,975.98	206,159.66	226,131.02
Henry M. Phillips Prize Essay				
Prize for essay on Science and Philosophy of Jurisprudence	264.74	12,400.00	12,664.74	12,616.90
Total Restricted Funds	$ 1,596.93	$ 317,879.07	$ 319,476.00	$ 339,399.52

* Held by Pennsylvania Co., etc., as agent.

	Uninvested Cash 12-31-1942	Invested 12-31-1942	Total Funds at Book Value 12-31-1942	Total Funds at Book Value 12-31-1941
Associated Fund:				
Thomas Balch International Law				
For books relating to the Law of Nations........			$ 4,584.06	$ 4,779.57
Martin Boyé				
For books—Chemistry and Geology...............			3,293.96	3,488.42
Charles Francis Brush Endowment				
For general purposes......			10,960.87	11,653.73
Auguste Carlier				
For books...............			13,692.40	14,500.74
Benjamin Franklin				
For books...............			9,713.17	10,286.60
Thomas Jefferson				
For books...............			3,657.81	3,873.75
John F. Lewis Prize				
For an award to the American Citizen who shall announce at any general or special meeting of the Society and publish among its papers some truth which the Council of the Society shall deem worthy of the award...........			9,943.55	10,530.56
Magellanic Fund				
Prize for discovery or invention and for books in field of Navigation, Astronomy or National Philosophy............			5,450.35	5,772.12
François André Michaux				
For books on Forestry.....			51,872.08	54,934.36
Joseph Parker Norris				
For books...............			4,552.74	4,821.51
Henry Phillips, Jr.				
For books on Archaeology and Philology (See Restricted Funds for Additional $491.53 in Fund)..			89,242.11	94,510.56
Robert Proud				
For books...............			5,577.23	5,906.48
Henry Seybert				
For books...............			3,738.38	3,959.08
William Tilghman				
For books...............			1,989.15	2,106.58
Whitfield Fund				
For general purposes......			44,173.23	——
Total Associated Fund	$ 1,927.84	$ 260,513.25	$ 262,441.09	$ 231,124.06
Total All Funds......	$64,366.48	$6,932,869.83	$6,997,236.31	$6,875,509.71

	Uninvested Cash 12-31-1942	Invested 12-31-1942	Total Funds at Book Value 12-31-1942	Total Funds at Book Value 12-31-1941
Brought forward—Total all Funds	$64,366.48	$6,932,869.83	$6,997,236.31	$6,875,509.71
Invested in:				
U. S. Government Obligations			$1,781,321.25	$1,854,122.34
Foreign Government Bonds			99,000.00	100,000.00
State, County and Municipal Bonds			488,826.25	607,038.75
Railway, Utility, Industrial and Other Bonds			1,715,575.78	1,357,317.25
Stocks			2,218,050.98	2,293,156.72
Mortgages and Mortgage Participations			53,746.10	57,692.28
Real Estate and Real Estate Participations			572,098.87	573,551.76
Perpetual Fire Insurance Policies (including prepaid value—Fine Arts Policy)			4,250.60	5,215.90
			$6,932,869.83	$6,848,095.00
Uninvested Cash			64,366.48	27,414.71
			$6,997,236.31	$6,875,509.71

Summary of Increase in Investments

Balance at Book Value 12-31-1941		$6,848,095.00
Add:		
Investments from Estate of James Edward Whitfield (at market value 7-16-42)		42,316.25
Stock Dividend of 37 shares of American Cyanamid Co. 5% Cum. Preference received on 500 shares American Cyanamid Co. class B Common		420.88
Investments Purchased at cost		1,122,470.41
Adjustment of Whitfield Fund to market value at 12-31-42		567.50
		$8,013,870.04
Deduct:		
Investments sold ($1,073,448.20) at book value	$1,061,426.98	
Book Loss on Exchange of Benjamin Franklin Hotel Class A 6% 1933 Bonds	2,499.00	
Premiums charged off on Bonds purchased	4,016.60	
Adjustment of Associated Fund to market value 12-31-42	13,057.63	
		1,081,000.21
Balance at Book Value 12-31-1942		$6,932,869.83

SCHEDULE VIII

BUILDING FUND—GIRARD TRUST COMPANY, TRUSTEE

CASH RECEIPTS AND DISBURSEMENTS

Year ended December 31, 1942

Principal Account

Balance, January 1, 1942		$11,655.93
Receipts:		
Investment in Bonds redeemed	$12,139.20	
On Account of Mortgages	9,136.00	
Real Estate sold, etc.	15,615.69	
Transferred from Income Account, net	12,223.57	
		49,114.46
		$60,770.39
Disbursements:		
Invested in Bonds	$45,000.00	
Invested in Mortgage Participations	9,718.60	
Costs, Real Estate Sales, Foreclosures, etc.	1,951.24	
Forwarding Charges on Investments	1.99	
		56,671.83
Balance, December 31, 1942		$ 4,098.56

Income Account

Receipts:		
Income from Investments		$21,079.93
Disbursements:		
Transferred to Fidelity-Philadelphia Trust Company, Treasurer (General Fund) in reimbursement for alterations and furnishing of Society's building, etc.	$ 5,132.09	
Real Estate Expenses	2,931.76	
Commission—Girard Trust Company	789.85	
Notary Fee	.50	
Transferred to Principal Account, net	12,223.57	
Accrued Interest on Bonds Purchased	2.16	
		$21,079.93

SCHEDULE IX

BUILDING FUND—GIRARD TRUST COMPANY, TRUSTEE

Summary of Assets

	Balance 1-1-1942	Additions	Deductions	Balance 12-31-1942
Pledges Receivable	$ 11,229.17	——	——	$ 11,229.17
Investments:				
Bonds (Par Value)	309,000.00	$ 45,000.00	$ 12,000.00	342,000.00
Stocks (At Cost)	49,644.13	——	——	49,644.13
Mortgages (Participations)	138,581.93	9,718.60	9,136.00	139,164.53
Real Estate (Participations)	126,649.37	1,951.24	28,322.24	100,278.37
Cash—Principal	11,655.93	49,114.46	56,671.83	4,098.56
Cash—Income	——	21,079.93	21,079.93	——
	$646,760.53	$126,864.23	$127,210.00	$646,414.76*

Summary of Decrease in Fund

Year ended December 31, 1942

Income from Investments	$21,079.93		
Less:			
Accrued Interest on Bonds Purchased	2.16		
		$21,077.77	
Gain on Sale of Bonds		139.20	
			$ 21,216.97
Less:			
Loss on Sale of Real Estate		$12,706.55	
Real Estate Expenses		2,931.76	
Transferred to Fidelity-Philadelphia Trust Company, Treasurer (General Fund) in reimbursement for alterations and furnishing of Society's building, etc.		5,132.09	
Commission—Girard Trust Company		789.85	
Forwarding Charges on Investments		1.99	
Notary Fee		.50	
			$ 21,562.74
Decrease in Fund			*$ 345.77*
Balance, January 1, 1942			646,760.53
Balance, December 31, 1942			$646,414.76

* Includes bonds at Par Value. Total Fund including bonds at cost is $654,248.51.

VI

SPECIAL COMMITTEE

1. REPORT ON ZOOLOGY IN THE LIBRARY OF THE AMERICAN PHILOSOPHICAL SOCIETY

In attempting to apply to the biological sciences a practical interpretation of the policies recommended in the report of the Farrand Special Committee on the Library and adopted in principle by this Committee the zoological and botanical works in the Library were surveyed, the latter by Dr. Francis W. Pennell.

This preliminary report deals with zoology only and is presented for purposes of discussion, in the hope that opinions of members will be crystalized and decisions arrived at. The section on zoology comprises about 600 titles, a few of which are runs of periodicals. About 100 additional titles were found in the sections on travels and geography, oceanography, anatomy, and medicine. The sections on paleontology and agriculture have not been checked, the latter because it is assumed that any included works relating to animals would be chiefly on economic entomology or other technological subjects, and the former because it will be reviewed later in cooperation with Dr. B. F. Howell. But all important paleontological works which it is decided to keep and to classify with geology should be cross-referenced under zoology or botany.

It is evident that no consistent attempt to form a zoological library had been made. The section evidently grew in a haphazard way chiefly through gifts, exchanges, and requests for special purchases. There is a rather large percentage of autographed gifts from authors. Nevertheless, there are included many items of great interest or inherent value, either (1) because they are landmarks of greater or less importance in the history of zoology, or (2) because they are autographed books by members of the Society and, therefore, have a place in its history, or (3) because of their rarity, quaintness, or sumptuousness, they have a collector's, or a monetary value. Those in the first two classes should be kept; the latter have little or no scientific value and unless it is desired to keep them for other reasons should be discarded with the greater mass of indiffer-

ent or highly specialized items. In this report they are placed on a doubtful list (No. 3).

Zoology is a modern science and has been little influenced by Greek philosophy or by what ancient and mediaeval writers, whether European or Oriental, knew or imagined about animals. If the zoological section of the Library includes good English translations of the treatises on animals of Aristotle and Pliny and the anatomical writings of Galen, its needs will be satisfied. The other classical works undoubtedly will be in other sections of the Library and available for study by the curious searcher for animal lore.

The quadrupedal foundations of a zoological science were laid in the period of the Renaissance in the researches and writings of (1) the Italian anatomists, of whom the greatest was Vesalius, (2) the early systematists and zoogeographers, typified by the Swiss Gessner, (3) the physiologists, with the Englishman Harvey as the most famous, and (4) the pioneer microscopists and students of the minutiae of living things, like Leeuwenhoek and Malpighi. Some of the more important authors of these groups are already represented in the Library but others are needed to give an adequate picture of the early history of zoology.

The zoological activities of the next or pre-Linnaean period (seventeenth and early eighteenth centuries) of systematic biology were stimulated by the rapid accumulation in the museums of Europe of great numbers of strange animals and plants resulting from the exploration and early settlement of the Americas. The systematic leg of the zoology created in the preceding period grew out of all balance to the other three, producing a lopsided creature that was all the more monstrous because there existed no adequate means of shaping its growth.

The natural result of this chaotic condition was that among the abler zoologists of the time, who were struggling to find a corrective, there should arise the great biological systemizer, the Swede, Carolus Linnaeus. His system, by which each described species of animal (and plant) received a simple Latin binomial designation which might not be duplicated for any other species, together with his hierarchical classification of group within group in a graded series of comprehensiveness, was immediately and generally adopted and made a clearly drawn map of what was before a pathless wilderness.

With publication of Linnaeus' *Systema Naturae* (10 Ed. 1758) it became for the first time possible to comprehend the known ani-

mal kingdom as a whole and to intercalate newly discovered animals in their proper places. This was a tremendous advance and a stimulus to further research. The facts discovered became the basis for subsequent investigations in comparative anatomy, embryology and the many other ramifications of animal study that ensued, and for some of the most important of biological theories, including the Lamarckian and Darwinian evolution principles.

What is of particular interest to us is that the Linnaean period ran with the later American Colonial period, the formative years of this Society and of its establishment in its present form. We must fix now the closing time of our historical review. By far the greatest biological event of the nineteenth century was the publication in 1859 of Darwin's *Origin of Species.* The general acceptance of the evolution principle during the following decade ushered in a new epoch in the history of zoology. The year 1870 is therefore taken as our closing date, which bars the consideration of the publications of any persons now living. It is of great interest and value in this study and at the same time a fine compliment to this Society that the "Pioneer Century" of Meisel's *Bibliography of American Natural History* begins with the "formation of an active American Philosophical Society in 1769" and ends with the close of the Civil War, a close approximation to 1870.

The history of zoology in America during the Colonial and Pioneer Periods and the history of zoology at the American Philosophical Society therefore coincide in time. While the basis of selection of titles for extra-American zoology should remain the same for these periods as for preceding ones, for American zoology the selection should be much more complete. Of our zoological members and for zoologists who have contributed to the history of American zoology we should have the significant publications but, unlike the specialized Academy of Natural Sciences, it is unnecessary to have complete sets of publications of individuals. However, in the fields of the history, biography, and bibliography of American zoology and zoologists our holdings should be complete. Fortunately in the writings of Dr. G. B. Goode on the Colonial Period and of Meisel on the Pioneer Century we have easy access to lists of these desiderata.

The items placed on the doubtful list should be held on the shelves until a decision regarding their disposal is reached. Of those listed to be discarded it is recommended that first considera-

tion be given to libraries in the Philadelphia area and that no item not available here be sent elsewhere. Nearly everything zoological in this Library is at the Academy of Natural Sciences also but some titles and some editions (mostly of early publications) on the discarded list are lacking there and should be offered to the Academy, which opens the facilities of its entire library to members of the American Philosophical Society. It may be wise to transfer books on deposit only until the new policies have been tested sufficiently to determine that they can be dispensed with permanently. The bulk of the discards will probably be most useful in assisting in the rehabilitation of war-devastated libraries.

The periodicals have been listed by Mrs. Hess, the Assistant Librarian. There are only a few restricted to zoology and there is no good reason for continuing these specialized journals, all of which are available at the Academy or elsewhere in Philadelphia. Some of the files might be used to complete gaps in files elsewhere. The disposition of the long series of comprehensive transactions of the great academies and societies concerns many divisions of the Society, but for zoology such series as those published by the Royal and Linnaean Societies of London, the Paris Museum of Natural History, the St. Petersburg Academy and others, have contributed so much of importance and are so impossible of replacement if destroyed, that it is wise to keep them in all libraries fortunate enough to possess them. Also, in view of their important bearing on the intellectual development of America and more specifically because of their close historical relation to the American Philosophical Society complete files of the publications of the older American institutions such as the American Academy of Arts and Sciences and the Academy of Natural Sciences of Philadelphia should be retained. All letters and manuscripts pertaining to the history of zoology should be kept and it is probable that some now belonging to the Academy of Natural Sciences will be added to the files of the American Philosophical Society.

What is here recommended for zoology may be expected in large part to apply to botany also but the lists of botanical books have not been so fully analysed.

The very difficult problem of whether and how to select contemporary writings that may be expected to shape the future history of zoology is not dealt with but would become the subject of a special report should the Library Committee decide to conserve such

material against the needs of the future. It should be pointed out, however, that should this decision be affirmative the policy regarding specialized periodicals recommended above would require revision, as recently in zoology not less than 85 per cent of original publication appears in periodicals. Books are chiefly restatements of facts already published but often include new generalizations and theories.

In order to implement the recommendations of this report, the following named lists have been prepared and after being checked with the several comprehensive histories of zoology will be submitted for the action of the Committee:

1. Books and pamphlets now in the Library that have an important place in the history of zoology and should be kept.
2. Those now in the Library that should be kept as contributory to the history of the American Philosophical Society.
3. Titles the disposition of which is doubtful and which should remain on the shelves until a final decision is reached.
4. Titles or editions not in the Library of the Academy of Natural Sciences and which do not come under lists 1, 2, and 3.
5. All other undesired items.
6. Authors and their selected works recommended for acquisition to supplement lists 1 and 2. Also a special list of histories, biographies, and bibliographies of zoology and selected zoologists.
7. Periodicals to be discontinued.

J. Percy Moore, *Chairman*

VII

AWARDS OF PRIZES

MAGELLANIC FUND, established in 1786 by the gift of 200 guineas by John Hyacinth de Magellan, of London, for a gold medal to be annually awarded under prescribed terms, to the author of the best discovery or most useful invention relating to navigation, astronomy, or natural philosophy (mere natural history only excepted). Any surplus of interest remaining to be used for such purposes as may be authorized under the Society's Charter and Laws.

Awards of the Magellanic Premium

December 1790. To FRANCIS HOPKINSON, Philadelphia, Penna. For the Invention of the Spring Block. "Description of a Spring Block Designed to Assist a Vessel in Sailing" (TRANS. Amer. Philos. Soc. **3**, Art. 40, 1793).

December 1792. To ROBERT PATTERSON, Philadelphia, Penna. For the Improvement of Electrical Rods, or Lightning Conductors, by Pointing them with Black-lead. "An Improvement on Metalic Conductors or Lightning-rods in a Letter to Dr. David Rittenhouse from Robert Patterson" (TRANS. Amer. Philos. Soc. **3**, Art. 35, 1793).

December 1792. To WILLIAM THORNTON, London, England. For "Cadmus" or a Philosophical Dissertation on the Elements of Written Language. "Cadmus, or a Treatise on the Elements of Written Language, illustrating, by a Philosophical Division of Speech, the power of each Character, thereby mutually fixing the Orthography and Orthoepy. With an Essay on the Mode of Teaching the Surd, or Deaf and Consequently Dumb to Speak" (TRANS. Amer. Philos. Soc. **3**, Art. 33, 1793).

December 1794. To NICOLAS COLLIN, Philadelphia, Penna. For a Paper on an Elevator (Nititor [sic] in ardua virtus). "Description of a Speedy Elevator by the Inventor" (TRANS. Amer. Philos. Soc. **4**, Art. 75, 1799).

November 1804. To CAPTAIN WILLIAM MUGFORD, Salem, Mass. For the Invention of a Temporary Rudder. "An account and description of a Temporary Rudder Invented by Capt. William Mugford of Salem, Mass." (TRANS. Amer. Philos. Soc. **6**, Art. 34, 1809).

December 1804. To DR. BEN SMITH BARTON, Philadelphia, Penna. For a Paper on a "Number of the Pernicious Insects of the United States."

October 1807. To JOHN GARNETT, New Brunswick, N. J. For a Paper on "A New Simple Nautical Chart." "Description and use of a new and simple Nautical Chart, for working the different problems in Navigation" (TRANS. Amer. Philos. Soc. 6. Art. 49, 1809).

April 1809. To JAMES HUMPHRIES, JR., Philadelphia, Penna. For a Model and Description of Steering Apparatus.

April 1820. To JOSHUA CHAPMAN, Bristol, Penna. For an Improvement in the Manufacture of Canvas.

March 1823. To DR. JAS. EWING, Philadelphia, Penna. For the invention of the "Improved Hydrant."

May 1825. To C. C. BRODIE. For an invention to repair the side of ships, under the surface of the water.

March 1836. To JAMES P. ESPY, Philadelphia, Penna. Author of the paper signed "Investigator."

December 1864. To PLINY EARLE CHASE, Philadelphia, Penna. For a paper on "The discovery of Certain new relations between the solar- and lunar-diurnal variations of magnetic force and of barometric pressure" (PROC. Amer. Philos. Soc. **9**: 487–495).

December 1887. To LEWIS M. HAUPT, Philadelphia, Penna. For a paper on "The Physical Phenomena of Harbor Entrances. Their Causes and Remedies. Defects of Present Methods of Improvement" (PROC. Amer. Philos. Soc. **25**: 19–41).

April 1922. To PAUL R. HEYL AND LYMAN J. BRIGGS, U. S. Bureau of Standards, Washington, D. C. For the invention of the Earth Inductor Compass. "The Earth Inductor Compass" (PROC. Amer. Philos. Soc. **61**: 15–32).

PHILLIPS PRIZE ESSAY FUND, established in 1888 by the gift of $5,000 by Miss Emily Phillips, of Philadelphia, in memory of her brother, Henry M. Phillips. Income to be used in the awarding of a prize for the best essay of real merit on the science and philosophy of jurisprudence.

Awards of the Henry M. Phillips Prize Essay

May 1895. To GEORGE H. SMITH, ESQ., Los Angeles, Calif. $500. "The Theory of State" (PROC. Amer. Philos. Soc. **34**: 181–334).

June 1900. To W. H. HASTINGS, ESQ., Wilber, Neb. $2,000. "The Development of Law as Illustrated by the Decisions Relating to the Police Power of the State" (PROC. Amer. Philos. Soc. **39**: 359–554).

April 1912. To CHARLES H. BURR, ESQ., Philadelphia, Penna. $2,000. "The Treaty-Making Power of the United States and the Methods of its Enforcement as Affecting the Police Powers of the States" (PROC. Amer. Philos. Soc. **51**: 271–422).

April 1921. To QUINCY WRIGHT, ESQ., Minneapolis, Minn. $2,000. "The Relative Rights, Duties and Responsibilities of the President, of the Senate and the House, and of the Judicary in Theory and Practice" (PROC. Amer. Philos Soc. **60**: 99–455).

October 1935. To LON L. FULLER, Dean of the Law School, Duke University, Durham, N. C. $1,500 and Diploma. "American Legal Realism" (PROC. Amer. Philos. Soc. **76**: 191–235).

April 1942. To EDWARD S. CORWIN, Princeton University, Princeton, N. J. $1,500 and Diploma. *The President: Office and Powers,* and his articles on "American Constitutional Law."

LEWIS FUND, established in 1935 by the gift of Mrs. John F. Lewis, of Philadelphia, of $10,000 in memory of her late husband; the income to be used each year as an award to the American citizen who shall announce at any general or special meeting of the Society, and publish among its papers, some truth which the Council of the Society shall deem worthy of the award.

Awards of the John F. Lewis Prize

April 1937. To RALPH E. CLELAND, Goucher College, Baltimore, Md. $300 and Diploma, for presentation to the Society and publishing in its PROCEEDINGS: "Cyto-taxonomic Studies on Certain Oenotheras from California" (Read April 19, 1934,—PROC. Amer. Philos. Soc. **75**: 339–429). "A Cyto-genetic and Taxonomic Attack upon the Phylogeny and Systematics of Oenothera (Evening Primrose) with Special Reference to the Sub-genus Onagra" (Read April 18, 1935,—PROC. Amer. Philos. Soc. **77**: 477–544).

April 1938. To ARTHUR J. DEMPSTER, University of Chicago, Chicago, Ill. $300 and Diploma, for presentation to the Society and publishing in its PROCEEDINGS: "New Methods in Mass Spectroscopy" (Read in part April 20, 1935,—PROC. Amer. Philos. Soc. **75**: 755–767). "Further Experiments on the Mass Analysis of the Chemical Elements" (Read April 25, 1936,—PROC. Amer. Philos. Soc. **76**: 491–496).

April 1939. To Henry Norris Russell, Princeton University Observatory, Princeton, N. J. $300 and Diploma, for presentation to the Society and publishing in its Proceedings: "Stellar Energy" (Read February 17, 1939,—Proc. Amer. Philos. Soc. **81**: 295–307).

April 1940. To Earle Radcliffe Caley, Princeton University, Princeton, N. J. $300 and Diploma, for presentation to the Society and publishing in its Memoirs: "The Composition of Ancient Greek Bronze Coins" (Read November 27, 1937,—Mem. Amer. Philos. Soc. **11**: 1–203).

April 1941. To George Howard Parker, Professor Emeritus of Zoology, Harvard University, Cambridge, Mass. $300 and Diploma, for presentation to the Society and publishing in its Proceedings: "Integumentary Color Changes of Elasmobranch Fishes especially of Mustelus" (Read November 26, 1936,—Proc. Amer. Philos. Soc. **77**: 223–247). "Melanophore Responses and Blood Supply (Vasomotor Changes)" (Read November 27, 1937,—Proc. Amer. Philos. Soc. **78**: 513–527). "On the Neurohumors of the Color Changes in Catfishes and on Fats and Oils as Protective Agents for such Substances" (Read April 18, 1940,—Proc. Amer. Philos. Soc. **83**: 379–408).

VIII

GENERAL MEETING LECTURES

THE R. A. F. PENROSE, JR., LECTURES

1934. Edwin G. Conklin, "A Generation's Progress in the Study of Evolution"
1935. W. F. G. Swann, "Is the Universe Running Down?"
1936. Dixon Ryan Fox, "The American Tradition in a New Day"
1937. Irving Langmuir, "The Surfaces of Solids and Liquids"
1938. S. A. Mitchell, "With an Astronomer on an Eclipse Expedition"
1939. Eduard Beneš,* "Politics as Art and Science"
1940. Archibald MacLeish, "Writers and Scholars"
1941. Edward C. Tolman, "Motivation, Learning, and Adjustment"
1942. James R. Angell, "The Problem of Education in a World at War"

SPECIAL LECTURES

November 1936. D'Arcy W. Thompson, "Astronomy in the Classics"

February 1937. Frederick P. Keppel, "The Responsibility of Endowments in the Promotion of Knowledge"

November 1937. William Lyon Phelps,* "Truth and Poetry"

February 1938. Dumas Malone, "The Scholar and the Public"
Donald P. Bean, "The Riddle of Research"

November 1938. Alfred J. Lotka, "Contacts of Population Study with Related Branches of Science"

February 1939. Henry Norris Russell, "Stellar Energy and the Evolution of Atoms"

November 1939. Carlton J. H. Hayes, "The Novelty of Totalitarianism in the History of Western Civilization"

* Franklin Medal presented.

February 1940. Laurence M. Gould, "Glaciers of the Antarctic"

April 1940. Dayton C. Miller, "The Pipes of Pan, Old and New"

November 1940. Edward S. Corwin,* "Some Aspects of the Presidency"

February 1941. John A. Fleming, "Geomagnetism: World-Wide and Cosmic Aspects with Especial Reference to Early Research in America"

April 1941. Hugh S. Taylor,* "Large Molecules Through Atomic Spectacles"

November 1941. Vilhjalmur Stefansson, "Military Aspects of the Arctic"

April 1942. Fay-Cooper Cole,* "The Carnegie Institution's Work in Central America and Mexico"

November 1942. John Dickinson, "The Philosophy of Government in Our Earlier and Later History"

IX

REPRESENTATION AT CELEBRATIONS OF SOCIETIES, INSTITUTIONS, ETC.

January 16. Celebration of the birthday of Benjamin Franklin by the Poor Richard Club of Philadelphia and the Franklin Institute of Pennsylvania. Roland S. Morris, William E. Lingelbach, Edwin G. Conklin, and Laura E. Hanson.

April 7, 8, 9, and 10. Centenary Celebration of the Founding of the American Oriental Society, at Boston and Cambridge. E. A. Speiser.

April 10–11. Forty-sixth Annual Meeting of the American Academy of Political and Social Sciences, Philadelphia. Charles J. Rhoads, Morris E. Leeds, and John Dickinson.

April 16. Thirty-seventh Meeting of the Pennsylvania Federation of Historical Societies, at Harrisburg. William E. Lingelbach.

April 20. Convocation of the Jewish Theological Seminary of America at the University of Chicago, commemorating the thousandth anniversary of the death of Rabbi Saadia Gaon. Arthur H. Compton.

September 25. Inauguration of Everett Needham Case as President of Colgate University. Harold W. Dodds.

October 4–5. Dedication of the Mineral Industries Building of the State of West Virginia, West Virginia Board of Control, the Board of Governors of West Virginia University, and the Geological and Economic Survey Commission, at Morgantown, W. Va. Greetings were sent.

October 5. Celebration of the Fiftieth Anniversary of the Founding of the Woman's College of the University of North Carolina. William deBerniere MacNider.

American Documentation Institute. Jacob R. Schramm.

American Council of Learned Societies, Washington, D. C. Guy Stanton Ford, 1942–44; William E. Lingelbach, 1938–42; 1942–46.

National Research Council, Division of Foreign Relations, Washington, D. C. Leo S. Rowe, 1940–43.

X

LIST OF MEMBERS

MEMBERS RESIDING WITHIN THE UNITED STATES

Date of Election

Abbot, Charles Greeley, M.Sc., D.Sc., LL.D. 1914
Astrophysicist, Secretary, Smithsonian Institution,
Washington, D. C.

Adams, Edwin Plimpton, M.S., Ph.D., Sc.D. 1915
Professor of Physics, Princeton University,
Princeton, N. J.

Adams, James Truslow, A.M., LL.D., Litt.D., L.H.D. 1938
Author, American Historian.
Sheffield House, Southport, Conn.

Adams, Joseph Quincy, Ph.D., Litt.D. 1940
Director, Folger Shakespeare Library.
2915 Foxhall Road, N.W., Washington, D.C.

Adams, Roger, A.B., A.M., Ph.D., Sc.D. 1935
Head of the Chemistry Department, University of Illinois.
603 Michigan Avenue, Urbana, Ill.

Adams, Walter Sydney, A.M., Sc.D., LL.D. 1915
Astronomer, Director, Mount Wilson Observatory,
Pasadena, Calif.

Aitken, Robert Grant, A.M., Sc.D., LL.D. 1919
Astronomer, Director Emeritus, Lick Observatory.
1109 Spruce Street, Berkeley, Calif.

Albright, William F., Ph.D., Litt.D., D.H.L., Th.D. 1929
Orientalist and Archaeologist, Professor of Semitic
Languages, Johns Hopkins University, Baltimore, Md.

Alexander, James W., A.M., Ph.D., A.A. 1928
Professor of Mathematics, Institute for Advanced Study.
29 Cleveland Lane, Princeton, N. J.

Date of Election

Allen, Charles Elmer, Ph.D., Sc.D. 1922
Professor of Botany, University of Wisconsin.
2014 Chamberlin Avenue, Madison, Wis.

Anderson, Carl David, Ph.D. 1938
Professor of Physics, California Institute of Technology, Pasadena, Calif.

Andrews, Charles McLean, Ph.D., L.H.D., Litt.D., LL.D. 1924
Professor Emeritus of American History, Yale University. 424 St. Ronan Street, New Haven, Conn.

Andrews, Donald Hatch, A.B., Ph.D. 1933
Chairman, Chemistry Department, Director, Chemistry Laboratory, Johns Hopkins University.
204 Southway, Guilford, Baltimore, Md.

Andrews, Roy Chapman, M.A., Sc.D. 1927
Zoologist, Director, American Museum of Natural History, New York, N. Y.

Angell, James Rowland, A.B., A.M., Ph.D., Litt.D., LL.D. 1924
Psychologist, President Emeritus, Yale University; Educational Counselor, National Broadcasting Company.
155 Blake Road, Hamden, New Haven, Conn.

Armstrong, Edward Cooke, A.B., Ph.D., LL.D., L.H.D. 1932
Professor of French Language, Princeton University.
26 Edgehill Street, Princeton, N. J.

Armstrong, Hamilton Fish, A.B. 1940
Writer; Editor, *Foreign Affairs.*
45 East 65th Street, New York, N. Y.

Aydelotte, Frank, A.M., B.Litt., L.H.D., LL.D., D.Litt., D.C.L. 1923
Director, Institute for Advanced Study, Princeton, N. J.

Baekeland, Leo H., D.Sc., D.Nat.Sc., D.Ch., D.Ap.Sc., LL.D. 1935
Chemist, Former President, Bakelite Corporation.
30 East 42nd Street, New York, N. Y.

Bailey, Irving Widmer, A.B., M.F., Sc.D. 1926
Professor of Plant Anatomy, Harvard University.
17 Buckingham Street, Cambridge, Mass.

	Date of Election
Bailey, Liberty Hyde, Litt.D., LL.D. Botanist, Professor Emeritus of Agriculture (Horticulture), Director (ret.), Bailey Hortorium, Cornell University, Ithaca, N. Y.	1896
Bancroft, Wilder Dwight, A.B., Ph.D., Sc.D., LL.D. Professor Emeritus of Physical Chemistry, Cornell University. 7 East Avenue, Ithaca, N. Y.	1920
Barbour, Thomas, Ph.D., Sc.D., S.D., Dr. en Ciencias Director, University Museum and Museum of Comparative Zoology, Professor of Zoology, Harvard University. 278 Clarendon Street, Boston, Mass.	1937
Bartlett, Harley Harris, A.B. Chairman, Department of Botany, Director, Botanical Garden, University of Michigan. 538 Church Street, Ann Arbor, Mich.	1929
Bateman, Harry, M.A., Ph.D. Professor of Mathematics, Theoretical Physics and Aeronautics, California Institute of Technology, Pasadena, Calif.	1924
Beams, Jesse Wakefield, Ph.D. Professor of Physics, University of Virginia. Monroe Hill, University, Va.	1939
Beard, Charles Austin, LL.D., Ph.D. Historian, Formerly Professor of Politics, Columbia University. New Milford, Conn.	1936
Becker, Carl L., Ph.D., Litt.D. Professor Emeritus of History, Cornell University. 109 West Upland Road, Ithaca, N. Y.	1936
Beeson, Charles Henry, Ph.D. Professor of Latin, University of Chicago. 1228 East 56th Street, Chicago, Ill.	1940
Bell, Eric Temple, Ph.D. Professor of Mathematics, California Institute of Technology. 434 South Michigan Avenue, Pasadena, Calif.	1937

Date of Election

Benedict, Francis Gano, Ph.D., Sc.D., M.D. 1910
Physiologist, Director (ret.), Nutrition Laboratory, Carnegie Institution of Washington (1907–37). Machiasport, Maine.

deBenneville, James S., A.B. 1897
Chemist. 907 West Roosevelt Boulevard, Philadelphia, Pa.

Berkey, Charles Peter, B.S., M.S., Ph.D., Sc.D. 1928
Newberry Professor Emeritus of Geology, Columbia University, New York, N. Y.

Berry, Edward Wilber 1919
Professor of Paleontology, Dean, Provost, Johns Hopkins University, Baltimore, Md.

Bigelow, Henry Bryant, Ph.D. 1937
Director, Woods Hole Oceanographic Institution; Professor of Zoology, Harvard University. Museum of Comparative Zoology, Cambridge, Mass.

Birge, Edward Asahel, Ph.D., LL.D., Sc.D. 1923
Zoologist, President Emeritus, University of Wisconsin. 2011 Van Hise Avenue, Madison, Wis.

Birkhoff, George David, Ph.D., S.D., D. (hon.), LL.D. 1921
Perkins Professor of Mathematics, Harvard University. 987 Memorial Drive, Cambridge, Mass.

Blackwelder, Eliot, Ph.D. 1939
Professor and Executive Head, Department of Geology, Stanford University, Calif.

Blakeslee, Albert Francis, B.A., M.A., Ph.D., D.Sc. 1924
William Allan Neilson Research Professor of Botany, Smith College, Northampton, Mass.

Blegen, Carl William, Ph.D., M.A. 1941
Professor of Classical Archaeology, Fellow of the Graduate School of Arts and Sciences, University of Cincinnati, Cincinnati, Ohio.

Bliss, Gilbert Ames, B.S., M.S., Ph.D., Sc.D. 1926
Professor Emeritus of Mathematics, University of Chicago, Chicago, Ill.

	Date of Election
Bloomfield, Leonard, Ph.D. Professor of Linguistics, Yale University, New Haven, Conn.	1942
Bogert, Marston Taylor, A.B., Ph.B., Sc.D., LL.D., R.N.D. Professor Emeritus of Organic Chemistry in Residence, Columbia University, New York, N. Y.	1909
Bolton, Herbert Eugene, Ph.D., D.Litt., L.H D., LL.D. Sather Professor of History, Chairman, Department of History, Director, Bancroft Library, University of California, Berkeley, Calif.	1937
Bonner, Campbell, A.M., Ph.D. Professor of the Greek Language and Literature, University of Michigan. 1025 Martin Place, Ann Arbor, Mich.	1938
Bowen, Ira Sprague, Ph.D. Professor of Physics, California Institute of Technology, Pasadena, Calif.	1940
Bowen, Norman L., M.A., B.Sc., Ph.D., Sc.D., LL.D. Geologist, Charles L. Hutchinson Distinguished Service Professor of Petrology, University of Chicago, Chicago, Ill.	1930
Bowman, Isaiah, B.S., Ph.D., M.A., D.Sc., LL.D. Geographer, President, Johns Hopkins University, Baltimore, Md.	1923
Bridgman, Percy Williams, A.M., Ph.D., Sc.D. Physicist, Hollis Professor of Mathematics and Natural Philosophy, Harvard University. Research Laboratory of Physics, Cambridge, Mass.	1916
Briggs, Lyman J., Ph.D., Sc.D., D.Eng., LL.D. Physicist, Director, National Bureau of Standards. 3208 Newark Street, Cleveland Park, Washington, D. C.	1935
Bronk, Detlev W., M.S., Ph.D., Sc.D. Professor of Biophysics, Director, Eldridge Reeves Johnson Foundation for Medical Physics, University of Pennsylvania, Philadelphia, Pa.	1934
Brooke, C. F. Tucker, M.A., B.Litt., Litt.D. Sterling Professor of English, Yale University. 88 Cold Spring Street, New Haven, Conn.	1938

	Date of Election
Brooks, Van Wyck, Litt.D. Author and Literary Historian. Westport, Conn.	1939
Brubaker, Albert P., A.M., M.D., LL.D. Professor Emeritus of Physiology, Jefferson Medical College. 109 North 34th Street, Philadelphia, Pa.	1895
Bryant, William L. Paleontologist, Director, Park Museum, Providence, R. I.	1935
Buck, Carl Darling, A.B., Ph.D., Litt.D. Professor Emeritus of Comparative Philology, University of Chicago, Chicago, Ill.	1923
Buckley, Oliver Ellsworth, B.S., D.Sc., Ph.D. Physicist and Engineer, President, Bell Telephone Laboratories, 463 West Street, New York, N. Y.	1942
Buddington, Arthur F., Ph.D., Sc.D. Professor of Geology, Chairman, Department of Geology, Princeton University, Princeton, N. J.	1931
Bumpus, Hermon Carey, Ph.D., Sc.D., LL.D. Zoologist, Educator (ret.), Formerly Director, American Museum of Natural History. Duxbury, Mass.	1909
Burgess, Warren Randolph, Ph.D., LL.D. Banker and Statistician, Vice Chairman, National City Bank of New York. 30 West 54th Street, New York, N. Y.	1942
Bush, Vannevar, Sc.D., Eng.D., LL.D. Engineer, President, Carnegie Institution of Washington, Washington, D. C.	1937
Butler, Nicholas Murray, Ph.D., LL.D. President, Columbia University, New York, N. Y.	1938
Byrd, Richard Evelyn, D.Eng., Sc.D., LL.D. Geographer, Navigator, Rear-Admiral (ret.), United States Navy. 9 Brimmer Street, Boston, Mass.	1930
Calvert, Philip Powell, Ph.D. Professor Emeritus of Zoology, University of Pennsylvania. P. O. Box 14, Cheyney, Pa.	1918
Campbell, Douglas Houghton, Ph.D., LL.D. Professor Emeritus of Botany, Stanford University, Calif.	1910

Date of Election

Cannon, Walter Bradford, A.M., M.D., Sc.D., LL.D., Dr. (hon.) 1908
George Higginson Professor of Physiology,
Harvard Medical School, Boston, Mass.

Capps, Edward, Ph.D., LL.D., Litt.D., L.H.D. 1920
Professor Emeritus of Classics, Princeton University.
42 Mercer Street, Princeton, N. J.

Carlson, Anton Julius, A.M., Ph.D., M.D., LL.D. 1928
Professor of Physiology, University of Chicago.
5228 Greenwood Avenue, Chicago, Ill.

Carmichael, Leonard, Ph.D., Sc.D., Litt.D., LL.D. 1942
Psychologist, President, Tufts College, Medford, Mass.

Carpenter, Rhys, Ph.D., Litt.D. 1935
Professor of Archaeology, Bryn Mawr College.
Jerry Run, R.D. 2, Downingtown, Pa.

Carrel, Alexis, M.D., Sc.D., LL.D. 1909
Surgeon, Biologist, Member Emeritus, Rockefeller
Institute for Medical Research, 66th Street and
York Avenue, New York, N. Y.

Case, Ermine Cowles, A.B., A.M., M.S., Ph.D. 1931
Professor Emeritus of Historical Geology and
Paleontology, University of Michigan, Ann Arbor, Mich.

Castle, William Bosworth, M.D. 1939
Professor of Medicine, Harvard Medical School;
Associate Director, Thorndike Memorial Laboratory and
Director, Second and Fourth Medical Services
(Harvard), Boston City Hospital, Boston, Mass.

Castle, William Ernest, A.M., Ph.D., Sc.D., LL.D. 1910
Professor Emeritus of Genetics, Harvard University;
Research Associate in Genetics, University of California.
Hilgard Hall, Berkeley, Calif.

Cather, Willa, Litt.D., LL.D. 1934
Author. Care A. A. Knopf, 501 Madison Avenue,
New York, N. Y.

Cattell, James McKeen, Ph.D., LL.D., D.H.L., Sc.D. 1888
Psychologist, Editor. Garrison, N. Y.

Date of Election

Chamberlain, Joseph Perkins, Ph.D., LL.D. 1940
Professor of Public Law, Columbia University.
8 Sutton Square, New York, N. Y.

Chapman, Frank Michler, Sc.D. 1921
Curator in Ornithology, American Museum of Natural History, New York, N. Y.

Chase, George Henry, A.B., A.M., Ph.D., L.H.D., Litt.D. 1929
Professor of Archaeology, Dean of the University, Harvard University. 1 Bryant Street, Cambridge, Mass.

Cheyney, Edward Potts, A.M., Litt.D., LL.D. 1904
Professor Emeritus of European History, University of Pennsylvania. R.F.D. 3, Media, Pa.

Chinard, Gilbert, B.L., L.èsL., LL.D. 1932
Professor of French Literature, Princeton University.
93 Mercer Street, Princeton, N. J.

Chittenden, Russell H., Ph.D., LL.D., Sc.D., M.D. (hon.) 1904
Professor Emeritus of Physiological Chemistry, Director Emeritus, Sheffield Scientific School, Yale University.
83 Trumbull Street, New Haven, Conn.

Clark, William Mansfield, Ph.D., Sc.D. 1939
De Lamar Professor of Physiological Chemistry, Johns Hopkins University, School of Medicine, Baltimore, Md.

Cleland, Ralph Erskine, A.B., M.S., Ph.D. 1932
Professor and Head, Department of Botany and Bacteriology, Indiana University, Bloomington, Ind.

Coble, Arthur Byron, Ph.D., LL.D. 1939
Professor of Mathematics, University of Illinois.
702 W. Washington Boulevard, Urbana, Ill.

Cockerell, Theodore Dru Alison, D.Sc. 1928
Professor Emeritus of Zoology, University of Colorado.
908 10th Street, Boulder, Colo.

Cole, Fay-Cooper, Ph.D., Sc.D. 1941
Professor of Anthropology, Chairman of the Department, University of Chicago. 5626 Dorchester Avenue, Chicago, Ill.

	Date of Election
Commons, John Rogers, LL.D. Professor of Economics (ret.), University of Wisconsin. P. O. 1498, Ft. Lauderdale, Fla.	1936
Compton, Arthur Holly, B.Sc., Ph.D., Sc.D., LL.D. Professor of Physics, University of Chicago. 5637 Woodlawn Avenue, Chicago, Ill.	1925
Compton, Karl Taylor, Ph.D., Sc.D., D.Eng., LL.D. Physicist, President, Massachusetts Institute of Technology, Cambridge, Mass.	1923
Conant, James Bryant, Ph.D., LL.D. Chemist, President, Harvard University. 17 Quincy Street, Cambridge, Mass.	1935
Conklin, Edwin Grant, Ph.D., Sc.D., LL.D. Professor Emeritus of Biology, Princeton University, Princeton, N. J.	1897
Coolidge, William David, Ph.D., Sc.D. Physicist, Director, Research Laboratories of the General Electric Company. 1480 Lenox Road, Schenectady, N. Y.	1938
Corner, George Washington, M.D. Director, Department of Embryology, Carnegie Institution of Washington, Wolfe and Madison Streets, Baltimore, Md.	1940
Corwin, Edward Samuel, Ph.D., LL.D., Litt.D. Professor of Jurisprudence, Princeton University, Princeton, N. J.	1936
Cottrell, Frederick Gardner, Ph.D., LL.D. Chemist, Consultant to Research Corporation, New York. 3904 Ingomar Street, N.W., Washington, D. C.	1938
Crane, Robert Treat, Ph.D., LL.B. Executive Director, Social Science Research Council. 1165 Fifth Avenue, New York, N. Y.	1941
Cret, Paul Philippe, Sc.D., M.A., D.A. Architect, Professor Emeritus of Design, University of Pennsylvania. Architects' Building, Philadelphia, Pa.	1928
Crew, Henry, Ph.D. Professor Emeritus of Physics, Northwestern University. 620 Library Place, Evanston, Ill.	1921

Date of Election

†Crile, George, A.M., M.D., LL.D. 1912
Surgeon, Director of Research, Cleveland Clinic Foundation, Euclid Avenue at East 93d Street, Cleveland, Ohio.

Crocker, William, A.B., A.M., Ph.D. 1931
Botanist, Managing Director, Boyce Thompson Institute for Plant Research, Inc. 1086 North Broadway, Yonkers, N. Y.

Cross, Whitman, B.S., Ph.D., Sc.D. 1915
Geologist, United States Geological Survey (ret.). 101 East Kirke Street, Chevy Chase, Md.

Cross, Wilbur L., A.B., Ph.D., Litt.D., L.H.D., LL.D. 1934
Governor of Connecticut (1932–38); Professor Emeritus of English, Yale University; Editor of *The Yale Review*. 24 Edgehill Road, New Haven, Conn.

Dahlgren, Ulric, A.B., M.S. 1919
Professor Emeritus of Biology, Princeton University. 7 Evelyn Place, Princeton, N. J.

Daly, Reginald Aldworth, A.M., Ph.D., Sc.D. 1913
Professor of Geology, Harvard University. 23 Hawthorn Street, Cambridge, Mass.

Damrosch, Walter Johannes, Mus.D. 1939
Musician, Conductor. 168 East 71st Street, New York, N. Y.

Darrach, William, A.B., A.M., M.D., Sc.D., LL.D. 1929
Professor of Clinical Surgery, Dean Emeritus of the Medical Faculty, Columbia University. 180 Fort Washington Avenue, New York, N. Y.

Darrow, Karl Kelchner, Ph.D. 1936
Research Physicist, Bell Telephone Laboratories. 230 West 105th Street, New York, N. Y.

Davenport, Charles Benedict, Ph.D. 1907
Biologist. Cold Spring Harbor, Long Island, N. Y.

Davis, Bradley Moore, A.M., Ph.D. 1914
Professor of Botany, University of Michigan, Ann Arbor, Mich.

† Deceased January 7, 1943.

Date of Election

Davis, Harvey Nathaniel, Ph.D., Sc.D., LL.D., D.Eng. 1935
Mechanical Engineer, President, Stevens Institute of Technology. Hoxie House, Castle Point, Hoboken, N. J.

Davis, John William, A.B., LL.B., LL.D. 1923
Lawyer, United States Solicitor General (1913–18); United States Ambassador to Great Britain (1918–21). 15 Broad Street, New York, N. Y.

Davisson, Clinton J., Ph.D., D.Sc. 1929
Physicist, Bell Telephone Laboratories, 463 West Street, New York, N. Y.

Day, Arthur L., Ph.D., Sc.D. 1912
Geophysicist, Director (ret.), Geophysical Laboratory (1907–36), Carnegie Institution of Washington. 1565 Old Georgetown Road, Bethesda, Md.

Day, Edmund Ezra, Ph.D., LL.D. 1937
President, Cornell University, Ithaca, N. Y.

Delano, Frederic Adrian 1935
Administrator (ret.); Vice-chairman, National Resources Committee. 2400 16th Street, Washington, D. C.

Dempster, Arthur Jeffrey, A.B., A.M., Ph.D., Sc.D. 1932
Professor of Physics, University of Chicago. 5757 Kenwood Avenue, Chicago, Ill.

Derleth, Charles, Jr., C.E., LL.D. 1936
Engineer, Chairman, Department of Civil Engineering, University of California, Berkeley, Calif.

Detwiler, Samuel Randall, Ph.D. 1940
Professor of Anatomy, Columbia University, New York, N. Y.

Dewey, John, A.B., Ph.D., LL.D. 1911
Professor Emeritus of Philosophy, Columbia University. 1 West 89th Street, New York, N. Y.

Dickinson, John, Ph.D., LL.B., LL.D. 1940
Professor of Law, University of Pennsylvania; General Counsel, Pennsylvania Railroad Company. 1740 Broad Street Station Building, Philadelphia, Pa.

Date of Election

Dinsmoor, William Bell, Litt.D. 1933
Professor of Archaeology, Columbia University.
9 East 77th Street, New York, N. Y.

Dobzhansky, Theodosius 1942
Professor of Zoology, Columbia University,
New York, N. Y.

Dodds, Harold Willis, Ph.D., LL.D. 1935
Administrator, President, Princeton University,
Princeton, N. J.

Doisy, Edward Adelbert, M.S., Ph.D. 1942
Professor of Biochemistry, St. Louis University School
of Medicine. 310 Glen Road, Webster Groves, Mo.

Douglas, Lewis Williams, B.A., LL.D. 1942
President, Mutual Life Insurance Company of New York.
34 Nassau Street, New York, N. Y.

Douglass, Andrew Ellicott, D.Sc. 1941
Professor of Astronomy and Dendrochronology,
University of Arizona, Tucson, Ariz.

Dresden, Arnold, M.S., Ph.D. 1932
Professor of Mathematics, Swarthmore College.
606 Elm Avenue, Swarthmore, Pa.

Duane, Morris, A.B., LL.B. 1940
Lawyer, Duane, Morris and Heckscher,
1617 Land Title Building, Philadelphia, Pa.

DuBois, Eugene Floyd, M.D. 1940
Professor of Medicine, Cornell University Medical
College; Physician-in-Chief, New York Hospital.
525 East 68th Street, New York, N. Y.

DuBridge, Lee Alvin, A.M., Ph.D., Sc.D. 1942
Professor and Chairman, Department of Physics (on
leave of absence), Dean of the Faculty of Arts and
Sciences, University of Rochester. 64 Edgemoor Road,
Belmont, Mass.

Duggar, Benjamin Minge, A.M., Ph.D. 1921
Professor of Plant Physiology and Economic Botany,
University of Wisconsin, Madison, Wis.

	Date of Election
Dunbar, Carl Owen, Ph.D. Professor of Paleontology and Stratigraphy, Director, Peabody Museum, Yale University. 65 Cleveland Road, New Haven, Conn.	1942
Dunn, Gano, M.S., E.E., D.Sc. Engineer, President, J. G. White Engineering Corporation; President, Cooper Union for the Advancement of Science and Art. 80 Broad Street, New York, N. Y.	1924
Du Pont, Pierre Samuel, B.S. Chemist, Manufacturer, E. I. du Pont de Nemours and Company. Du Pont Building, Wilmington, Del.	1917
Durand, William Frederick, Ph.D., LL.D. Professor Emeritus of Mechanical Engineering, Stanford University, Calif.	1917
Edgerton, Franklin, Ph.D. Professor of Sanskrit and Comparative Philology, Yale University. 174 Blake Road, Hamden, New Haven, Conn.	1935
Einstein, Albert, Ph.D., M.D. Professor of Theoretical Physics, Institute for Advanced Study, Princeton, N. J.	1930
Eisenhart, Luther Pfahler, A.B., Ph.D., Sc.D., LL.D. Professor of Mathematics, Dean, Graduate School, Princeton University, Princeton, N. J.	1913
Erlanger, Joseph, B.S., M.D., LL.D., Sc.D. Professor of Physiology, Washington University. 4580 Scott Avenue, St. Louis, Mo.	1927
Evans, Griffith Conrad, Ph.D. Professor of Mathematics, University of California. 820 San Diego Road, Berkeley, Calif.	1941
Eyring, Henry, Ph.D. Professor of Chemistry, Princeton University, Princeton, N. J.	1941
Farrand, Max, Ph.D., Litt.D., LL.D. Historian, Research Associate, Huntington Library and Art Gallery. Reef Point, Bar Harbor, Maine.	1928

Date of Election

Fels, Samuel S., LL.D. 1939
President, Fels and Company, Paschall Oxygen Company. 39th and Walnut Streets, Philadelphia, Pa.

Ferguson, William Scott, A.M., Ph.D., LL.D., Litt.D. 1937
MacLean Professor of Ancient and Modern History, Dean, Faculty of Arts and Sciences, Harvard University. 8 Scott Street, Cambridge, Mass.

Fermi, Enrico, Ph.D. 1939
Professor of Physics, Columbia University, New York, N. Y.

Fernald, Merritt Lyndon, S.B., D.C.L., D.Sc. 1936
Professor of Natural History, Director, Gray Herbarium, Harvard University, Cambridge, Mass.

Fetter, Frank Albert, Ph.D., LL.D. 1935
Professor Emeritus of Political Economy, Princeton University. 168 Prospect Avenue, Princeton, N. J.

Fieser, Louis Frederick, Ph.D. 1941
Sheldon Emery Professor of Organic Chemistry, Harvard University. 27 Pinehurst Road, Belmont, Mass.

Fisher, Irving, B.A., Ph.D., LL.D. 1927
Professor Emeritus of Economics, Yale University. Box 1825, New Haven, Conn.

Flexner, Simon, M.D., Sc.D., LL.D. 1901
Pathologist, Director Emeritus, Rockefeller Institute for Medical Research, 66th Street and York Avenue, New York, N. Y.

Foote, Paul Darwin, A.B., M.A., Ph.D. 1927
Physicist, Executive Vice-president, Gulf Research and Development Company. P.O. Drawer 2038, Pittsburgh, Pa.

Forbes, Alexander, A.B., A.M., M.D. 1931
Professor of Physiology, Harvard Medical School, Shattuck Street, Boston, Mass.

Ford, Guy Stanton, Ph.D., Litt.D., LL.D., L.H.D. 1939
Executive Secretary and Editor, *American Historical Review.* Study 274, Library of Congress Annex, Washington, D. C.

	Date of Election
Fosdick, Raymond Blaine, B.A., M.A., LL.B., LL.D. Lawyer, President, Rockefeller Foundation and General Education Board, 49 West 49th Street, New York, N. Y.	1930
Fox, Dixon Ryan, Ph.D., Pd.D., L.H.D., Litt.D., LL.D., D.C.L. Historian, President, Union College, Schenectady, N. Y.	1935
Franck, James, Ph.D., LL.D. Professor of Physical Chemistry, University of Chicago. Chicago, Ill.	1937
Frankfurter, Felix, LL.B. Associate Justice, Supreme Court of the United States, Washington, D. C.	1939
Frost, Robert, L.H.D., Litt.D. Poet, Professor of English, Amherst College. South Shaftsbury, Vt.	1937
Gaposchkin, Cecilia Payne, B.A., Ph.D. Astronomer, Harvard College Observatory, Cambridge, Mass.	1936
Gasser, Herbert Spencer, A.M., M.D., Sc.D. Physiologist, Director, Rockefeller Institute for Medical Research, 66th Street and York Avenue, New York, N. Y.	1937
Gates, Thomas Sovereign, Ph.B., LL.B., LL.D. Administrator, President, University of Pennsylvania, Philadelphia, Pa.	1930
Gay, Edwin Francis, A.B., Ph.D., Litt.D., LL.D. Professor Emeritus of Economic History, Harvard University. 1650 Orlando Road, San Marino, Calif.	1932
Giauque, William Francis, Ph.D., Sc.D. Professor of Chemistry, University of California, Berkeley, Calif.	1940
Gies, William J., B.S., Ph.B., M.S., Ph.D., Sc.D., LL.D. Professor of Biological Chemistry, Columbia University Medical School. 630 West 168th Street, New York, N. Y.	1915

Date of Election

Gifford, Walter Sherman, A.B., LL.D., D.Sc., D.C.L. 1931
Administrator, President, American Telephone and Telegraph Company. 195 Broadway, New York, N. Y.

Gomberg, Moses, B.S., Sc.D., LL.D. 1920
Professor Emeritus of Chemistry, University of Michigan. 712 Onondaga Street, Ann Arbor, Mich.

Goodrich, Herbert Funk, A.B., LL.B., LL.D. 1937
Judge, United States Circuit Court of Appeals, Third Circuit. 7701 Cresheim Road, Chestnut Hill, Philadelphia, Pa.

Goodspeed, Arthur Willis, A.B., Ph.D. 1896
Professor Emeritus of Physics, University of Pennsylvania. Hopkinton, N. H.

Graham, Evarts Ambrose, M.D., Sc.D., LL.D., M.S. 1941
Professor of Surgery, Washington University School of Medicine, St. Louis, Mo.

Graves, Frank Pierrepont, Ph.D., Litt.D., L.H.D., LL.D., J.U.D., D.C.L. 1927
Educator, President, University of the State of New York; State Commissioner of Education, Emeritus. 58 South Swan Street, Albany, N. Y.

Greene, Evarts B., Ph.D., Litt.D., L.H.D., LL.D. 1931
Professor Emeritus of American History, Columbia University. Box 285, Croton-on-Hudson, N. Y.

Gregory, Herbert Ernest, Ph.D., D.Sc. 1923
Silliman Professor Emeritus of Geology, Yale University; Director Emeritus, Bernice P. Bishop Museum, Honolulu, Hawaii.

Gregory, William King, A.M., Ph.D., D.Sc. 1925
Professor of Vertebrate Paleontology, Columbia University; Curator, Department of Comparative Anatomy, Department of Ichthyology, American Museum of Natural History, New York, N. Y.

Gulick, Charles Burton, Ph.D. 1940
Eliot Professor Emeritus of Greek Literature, Harvard University. 59 Fayerweather Street, Cambridge, Mass.

	Date of Election
Haney, John Louis, A.B., A.M., B.S., Ph.D., LL.D. Educator, President, Central High School of Philadelphia. 6419 Woodbine Avenue, Overbrook, Philadelphia, Pa.	1929
Harkins, William Draper, A.B., Ph.D. Professor of Physical Chemistry, University of Chicago. 5437 Ellis Avenue, Chicago, Ill.	1925
Harper, Robert A., M.A., Ph.D., D.Sc. Professor Emeritus of Botany, Columbia University, New York, N. Y.	1909
Harrison, Ross G., M.A., Ph.D., M.D., Sc.D., LL.D. Professor Emeritus of Biology, Yale University; Chairman, National Research Council. 142 Huntington Street, New Haven, Conn.	1913
Harvey, E. Newton, Ph.D. Henry Fairfield Osborn Professor of Biology, Princeton University, Princeton, N. J.	1929
Hastings, A. Baird, Ph.D., Sc.D., B.S. Hamilton Kuhn Professor of Biological Chemistry, Harvard Medical School. Boston, Mass.	1941
Hawk, Philip Bovier, M.S., Ph.D. Chemist, President and Director, Food Research Laboratories, Inc., of New York. 48–14 Thirty-Third Street, Long Island City, N. Y.	1915
Hayes, Carlton Joseph Huntley, Ph.D., Litt.D., LL.D., L.H.D. Seth Low Professor of History, Columbia University; United States Ambassador to Spain (1942–). 427 West 117th Street, New York, N. Y.	1940
Hayward, Nathan, A.B., S.B. President (ret.), The Franklin Institute. 12 South Twelfth Street, Philadelphia, Pa.	1937
Heiser, Victor George, A.B., M.D., Sc.D., LL.D. Physician (ret.). Bantam, Conn.	1918
Henderson, Yandell, Ph.D., M.D.(hon.) Professor Emeritus of Physiology, Yale University. 440 Prospect Street, New Haven, Conn.	1935

Date of Election

Hendrickson, George Lincoln, A.B., L.H.D. 1932
Professor of Greek and Latin Literature,
851 Branford College, Yale University, New Haven, Conn.

Hisaw, Frederick Lee, Ph.D., LL.D. 1940
Professor of Zoology, Harvard University,
Cambridge, Mass.

Hobbs, William Herbert, A.M., Ph.D., D.Eng., LL.D. 1909
Professor Emeritus of Geology, University of Michigan.
1705 Hill Street, Ann Arbor, Mich.

Holland, Leicester Bodine, B.S., Ph.D. 1931
Chief, Division of Fine Arts, Library of Congress.
415 West Price Street, Germantown, Philadelphia, Pa.

Hooton, Earnest A., B.A., M.A., Ph.D., B.Litt., Sc.D. 1931
Professor of Anthropology, Curator of Somatology,
Peabody Museum, Harvard University, Cambridge, Mass.

Hoover, Herbert, Dr. Eng., M.D., Sc.D., LL.D., D.C.L., J.D. 1918
Engineer, Thirty-first President of the United States.
Stanford University. Calif.

Hopkins, B Smith, Ph.D., D.Sc., LL.D. 1927
Professor Emeritus of Inorganic Chemistry,
University of Illinois, Urbana, Ill.

Hopkinson, Edward, Jr., A.B., LL.B. 1938
Lawyer, Banker, Trustee, University of Pennsylvania.
8700 Montgomery Avenue. Chestnut Hill,
Philadelphia, Pa.

Howard, Leland Ossian, M.D., Ph.D., Sc.D., LL.D. 1911
Zoologist, Consulting Entomologist, United States
Public Health Service. Bureau of Entomology,
United States Department of Agriculture,
Washington, D. C.

Howell, William Henry, A.B., Ph.D., M.D., Sc.D., LL.D. 1903
Professor Emeritus of Physiology, Formerly Dean,
Medical Faculty and Director. School of Hygiene,
Johns Hopkins University. 112 St. Dunstan's Road,
Baltimore, Md.

	Date of Election
Hrdlička, Aleš, M.D., Sc.D. Curator, Division of Physical Anthropology, United States National Museum, Washington, D. C.	1918
Hubble, Edwin P., B.Sc., Ph.D., B.A., D.Sc., LL.D. Astronomer, Mount Wilson Observatory, Pasadena, Calif.	1929
Hudson, Manley Ottmer, A.M., LL.B., S.J.D., LL.D. D.C.L. Judge, Permanent Court of International Justice; Bemis Professor of International Law, Harvard University, Cambridge, Mass.	1941
Huebner, Solomon Stephen, Ph.D., Sc.D., B.L., M.L. Professor of Insurance and Commerce, University of Pennsylvania; President, American College of Life Underwriters. 697 South Highland Avenue, Merion, Pa.	1930
Hughes, Charles Evans, A.B., A.M., LL.B., LL.D., D.C.L. Chief Justice of the United States (ret.). 2223 R Street, N.W., Washington, D. C.	1926
Hulett, George A., A.B., Ph.D. Professor Emeritus of Physical Chemistry, Princeton University. 44 Washington Road, Princeton, N. J.	1913
Humphreys, William Jackson, A.B., C.E., Ph.D. Professor Emeritus of Meteorological Physics, George Washington University; Collaborator, United States Weather Bureau, Washington, D. C.	1929
Hunsaker, Jerome Clarke, D.Sc. Head, Department of Mechanical Engineering, Massachusetts Institute of Technology; Professor in Charge, Guggenheim Aeronautical Laboratory. 10 Louisburg Square, Boston, Mass.	1940
Hunter, Walter Samuel, Ph.D. Professor of Psychology, Director, Psychological Laboratory, Brown University. 61 Prospect Street, Providence, R. I.	1941
Huntington, Edward Vermilye, A.B., A.M., Ph.D., Sc.D. Mathematician, Professor Emeritus of Mechanics, Harvard University. 48 Highland Street, Cambridge, Mass.	1933

Date of Election

Ives, Herbert E., B.S., Ph.D., Sc.D. 1917
Physicist, Bell Telephone Laboratories.
32 Laurel Place, Montclair, N. J.

Jackson, Dugald Caleb, C.E., D.Sc., D.Eng. 1931
Professor Emeritus of Electrical Engineering,
Massachusetts Institute of Technology.
5 Mercer Circle, Cambridge, Mass.

Jacobs, Merkel Henry, A.B., Ph.D. 1930
Professor of General Physiology, University of
Pennsylvania, Philadelphia, Pa.

Jayne, Horace Howard Furness, A.B., A.M. 1934
Archaeologist, Vice-director, Metropolitan Museum of Art,
New York, N. Y.

Jenks, John Story, M.A. 1936
Banker. 1421 Chestnut Street, Philadelphia, Pa.

Jennings, Herbert S., Ph.D., Sc.D., LL.D. 1907
Professor Emeritus of Zoology, Johns Hopkins University;
Research Associate, University of California,
Los Angeles, Calif.

Jessup, Philip C., LL.B., LL.D., Ph.D. 1939
Professor of International Law, Columbia
University, New York, N. Y.

Jewett, Frank Baldwin, A.B., Ph.D., D.Sc., D.Eng., LL.D. 1938
Vice-president, American Telephone and Telegraph
Company; Chairman of the Board, Bell Telephone
Laboratories, Inc. 195 Broadway, New York, N. Y.

Johnson, Alvin Saunders, Ph.D. 1942
Economist, Director and Chairman, Graduate Faculty
of Political Science, New School for Social Research.
Nyack, N. Y.

Johnson, Douglas, Ph.D., D.Sc. 1920
Geologist and Geographer, Professor of Physiography,
Columbia University, New York, N. Y.

Johnson, Eldridge Reeves, A.E.D. 1928
Industrialist, Founder, Victor Talking Machine Company.
608 West Jersey Trust Building, Camden, N. J.

	Date of Election
Johnson, Emory R., Litt.M., Ph.D., Sc.D. Professor Emeritus of Transportation and Commerce, Logan Hall, University of Pennsylvania, Philadelphia, Pa.	1915
Jones, Howard Mumford, Litt.D., L.H.D. Professor of English, Harvard University, Cambridge, Mass.	1941
Jones, Lewis Ralph, Ph.B., Ph.D., Sc.D., LL.D. Professor Emeritus of Plant Pathology, University of Wisconsin, Madison, Wis.	1925
Joslin, Elliott Proctor, B.A., M.A., Ph.B., M.D. Physician, Clinical Professor Emeritus of Medicine, Harvard Medical School. 81 Bay State Road, Boston, Mass.	1925
Kármán, Theodor von, Ph.D., D.Eng., D.Sc. Professor of Aeronautics, Director, Guggenheim Aeronautics Laboratory, California Institute of Technology. 1501 South Marengo Avenue, Pasadena, Calif.	1941
Kelley, Nicholas, A.B., LL.B. Lawyer, Member of the Firm, Larkin, Rathbone, and Perry; Vice-president, General Counsel and Director, Chrysler Corporation. 70 Broadway, New York, N. Y.	1942
Kemmerer, Edwin Walter, A.B., Ph.D., LL.D., D.C.S., D.Sc. Political Economist, Professor of International Finance, Princeton University. 161 Hodge Road, Princeton, N. J.	1932
Keppel, Frederick Paul, Litt.D., LL.D. President (ret.), Carnegie Corporation of New York, 522 Fifth Avenue, New York, N. Y.	1938
Kettering, Charles Franklin, M.E., E.E., D.Eng., D.Sc. Research Engineer, Vice-president, General Motors Corporation; General Director, Research Laboratories Division, General Motors Corporation. Ridgeleigh Terrace, Dayton, Ohio.	1930

Date of Election

Keyes, Frederick George, M.S., Ph.D., D.Sc. 1938
Professor and Head, Department of Chemistry, Massachusetts Institute of Technology.
15 Berkeley Street, Cambridge, Mass.

Kidder, Alfred Vincent, Ph.D., LL.D. 1934
Archaeologist, Chairman, Division of Historical Research, Carnegie Institution of Washington.
10 Frisbie Place, Cambridge, Mass.

Kistiakowsky, George Bogdan, Ph.D. 1940
Professor of Chemistry (on leave of absence), Harvard University. 245 Melwood Street, Pittsburgh, Pa.

Kline, John Robert, Ph.D. 1941
Professor of Mathematics, Chairman of the Department, University of Pennsylvania. 529 Riverview Avenue, Swarthmore, Pa.

Kofoid, Charles A., A.M., Ph.D., Sc.D., LL.D. 1924
Professor Emeritus of Zoology, University of California, Berkeley, Calif.

Köhler, Wolfgang, Ph.D. 1939
Professor of Psychology, Swarthmore College.
603 Elm Avenue, Swarthmore, Pa.

Kraus, Charles August, Ph.D. 1939
Professor of Chemistry and Director of Research in Chemistry, Brown University.
92 Keene Street, Providence, R. I.

Kroeber, Alfred Louis, Ph.D. 1941
Professor of Anthropology, Director, Anthropological Museum, University of California, Berkeley, Calif.

Kunkel, Louis Otto, Ph.D. 1942
Botanist, Member, Rockefeller Institute for Medical Research, Princeton, N. J.

Lamb, Arthur Becket, Ph.D., D.Sc. 1936
Professor of Chemistry, Dean, Graduate School of Arts and Sciences, Harvard University.
12 Oxford Street, Cambridge Mass.

	Date of Election
Lamont, Thomas William, A.B., LL.D. Banker, Trustee. 23 Wall Street, New York, N. Y.	1932
Lampland, Carl O., A.B., A.M., LL.D. Astronomer, Lowell Observatory, Flagstaff, Ariz.	1931
Lancaster, Henry Carrington, M.A., Ph.D. Professor of French Literature, Chairman, Department of Romance Languages, Johns Hopkins University. 604 Edgevale Road, Baltimore, Md.	1938
Landis, James McCauley, LL.B., S.J.D. Director, United States Office of Civilian Defense; Dean, Harvard Law School. 7 Francis Street, Cambridge, Mass.	1942
Landsteiner, Karl, M.D., D.Sc. Pathologist, Rockefeller Institute for Medical Research. 25 East 86th Street, New York, N. Y.	1935
Langmuir, Irving, M.A., Ph.D., Sc.D., LL.D. Chemist and Physicist, Associate Director, Research Laboratory, General Electric Company, Schenectady, N. Y.	1922
Lashley, Karl Spencer, M.S., Ph.D., Sc.D. Research Professor of Neuropsychology, Harvard University. Yerkes Laboratories of Primate Biology, Orange Park, Fla.	1938
Lawrence, Ernest Orlando, B.S., A.M., Ph.D., Sc.D., LL.D. Professor of Physics, Director, Radiation Laboratory, University of California, Berkeley, Calif.	1937
Lawson, Andrew Cowper, M.A., Ph.D., Sc.D., LL.D. Professor of Mineralogy and Geology (ret.), University of California, Berkeley, Calif.	1925
Leeds, Morris Evans, D.Eng. Chairman of the Board, Leeds and Northrup Company. 1025 Westview Street, Philadelphia, Pa.	1940
Lefschetz, Solomon, M.E., Ph.D. Research Professor of Mathematics, Princeton University. 129 Broadmead, Princeton, N. J.	1929

Date of Election

Leith, Charles Kenneth, B.S., Ph.D., LL.D., D.Sc. 1926
Professor of Geology, University of Wisconsin.
Moraine, Old Sauk Road, Madison, Wis.

Leland, Waldo G., A.B., A.M., Litt.D., L.H.D. 1931
Historian, Director, American Council of Learned Societies, 1219 Sixteenth Street, N.W., Washington, D. C.

Leuschner, Armin Otto, A.B., Ph.D., Sc.D., LL.D. 1924
Professor of Astronomy, Director Emeritus, Students' Observatory, University of California.
1816 Scenic Avenue, Berkeley, Calif.

Leverett, Frank, B.Sc., Sc.D. 1924
Senior Geologist (ret.), United States Geological Survey.
1724 South University Avenue, Ann Arbor, Mich.

Lewis, Clarence Irving, Ph.D. 1942
Professor of Philosophy, Harvard University.
23 Oakland Street, Lexington, Mass.

Lewis, Gilbert Newton, A.B., A.M., Ph.D., D.Sc. 1918
Professor of Chemistry, Dean, College of Chemistry, University of California, Berkeley, Calif.

Lillie, Frank Rattray, B.A., Ph.D., Sc.D., LL.D. 1916
Professor Emeritus of Embryology, University of Chicago. 5801 Kenwood Avenue, Chicago, Ill.

Lillie, Ralph Stayner, B.A., Ph.D., Sc.D. 1937
Professor Emeritus of General Physiology, University of Chicago. 5545 Kenwood Avenue, Chicago, Ill.

Lingelbach, William E., B.A., Ph.D., Litt.D. 1916
Professor of Modern European History, University of Pennsylvania.
4304 Osage Avenue, Philadelphia, Pa.

Livingston, Burton E., B.S., Ph.D. 1933
Professor of Plant Physiology and Forest Ecology, Director, Laboratory of Plant Physiology, Johns Hopkins University. Riderwood, Md.

Loeb, Leo, M.D. 1910
Professor Emeritus of Pathology, Washington University. 40 Crestwood Drive, St. Louis, Mo.

	Date of Election
Long, Esmond Ray, Ph.D., M.D. Director, Henry Phipps Institute, Professor of Pathology, University of Pennsylvania; President, Wistar Institute. Henry Phipps Institute, Seventh and Lombard Streets, Philadelphia, Pa.	1940
Loomis, Alfred Lee, A.B., LL.B., D.Sc., M.Sc. Physicist, Director, Loomis Laboratories. Tuxedo Park, N. Y.	1930
Lovejoy, Arthur Oncken, A.B., A.M., LL.D. Professor of Philosophy, Johns Hopkins University. 827 Park Avenue, Baltimore, Md.	1932
Lovett, Edgar Odell, Ph.D., Sc.D., LL.D. Mathematician and Astronomer, President, The Rice Institute, Houston, Texas.	1904
†Lowell, Abbott Lawrence, A.B., LL.B., Ph.D., Litt.D., LL.D. President Emeritus, Harvard University. 171 Marlborough Street, Boston, Mass.	1909
Lowes, John Livingston, Ph.D., LL.D., Litt.D., L.H.D. Francis Lee Higginson Professor Emeritus of English Literature, Harvard University. 984 Memorial Drive, Cambridge, Mass.	1934
Lowie, Robert Harry, Ph.D., Sc.D. Professor of Anthropology, University of California. 2521 Benvenue Avenue, Berkeley, Calif.	1942
Lydenberg, Harry Miller, L.H.D., Litt.D. Formerly Director, New York Public Library; Director, Benjamin Franklin Library. Paseo de la Reforma 27, Mexico, D. F., Mexico.	1939
Lyman, Theodore, A.M., Ph.D. Professor Emeritus of Physics, Director, Jefferson Laboratory, Harvard University, Cambridge, Mass.	1918
McClelland, George William, Ph.D., LL.D. Professor of English, Provost, University of Pennsylvania. 4037 Pine Street, Philadelphia, Pa.	1941

† Deceased January 6, 1943.

Date of Election

McClung, Clarence E., Ph.G., A.B., A.M., Ph.D., Sc.D. 1913
Professor Emeritus of Zoology, University of Pennsylvania. 417 Harvard Avenue, Swarthmore, Pa.

McClure, Charles Freeman Williams, A.B., A.M., Sc.D. 1897
Professor Emeritus of Comparative Anatomy, Princeton University. 1 Battle Road, Princeton, N. J.

MacCurdy, George Grant, A.B., A.M., Ph.D. 1925
Professor Emeritus of Anthropology, Yale University; Director, American School of Prehistoric Research, Old Lyme, Conn.

McDaniel, Walton Brooks, A.B., A.M., Ph.D. 1917
Professor Emeritus of Latin Language and Literature, University of Pennsylvania. 4082 Malaga Avenue, Coconut Grove, Fla.

MacDougal, Daniel Trembly, M.A., Ph.D., LL.D. 1916
Director (ret.), Laboratory for Plant Physiology, Carnegie Institution of Washington. Carmel, Calif.

Macfarlane, John Muirhead, B.S., Sc.D., LL.D., Litt.D. 1892
Professor Emeritus of Botany, University of Pennsylvania. "The Windmill," Paoli, Pa.

McGregor, James Howard, B.S., M.A., Ph.D. 1929
Professor of Zoology, Columbia University, New York, N. Y.

McIlwain, Charles Howard, A.M., Ph.D., LL.D. 1938
Eaton Professor of the Science of Government, Harvard University. 48 Village Hill Road, Belmont, Mass.

MacInnes, Duncan Arthur, M.S., Ph.D. 1942
Physical Chemist, Member, Rockefeller Institute for Medical Research. 345 East 68th Street, New York, N. Y.

MacIver, Robert Morrison, M.A., Ph.D., B.A., Litt.D. 1942
Lieber Professor of Political Philosophy and Sociology, Columbia University. Palisades, N. Y.

McMath, Robert Raynolds, C.E., A.M., D.Sc. 1942
Founder and Director, McMath-Hulbert Observatory, University of Michigan, Lake Angelus, Pontiac, Mich.

	Date of Election
MacNider, William de Berniere, M.D., Sc.D., LL.D. Kenan Research Professor of Pharmacology, University of North Carolina, Chapel Hill, N. C.	1939
Magie, William Francis, A.M., Ph.D., LL.D., D.Sc. Professor Emeritus of Physics, Princeton University. 118 Library Place, Princeton, N. J.	1896
Mann, Thomas, D.Litt. Author. 1550 San Remo Drive, Pacific Palisades, Calif.	1942
Mark, Edward Laurens, A.M., Ph.D., LL.D. Professor Emeritus of Anatomy, Harvard University. 109 Irving Street, Cambridge, Mass.	1907
Mason, William Smith, Ph.B., A.M., L.H.D., D.Litt. Man of Affairs, Collector of Frankliniana, University Trustee. 1401 Ridge Avenue, Evanston, Ill.	1928
Mather, Frank Jewett, Jr., Ph.D., L.H.D. Professor Emeritus of Art and Archaeology, Princeton University. Washington Crossing, Pa.	1940
Matthews, Albert, A.B. Modern Philologist and Historian. 19 St. Botolph Street, Boston, Mass.	1899
Mees, Charles Edward Kenneth, D.Sc. Chemist, Vice-president in Charge of Research and Development, Eastman Kodak Company, Rochester, N. Y.	1937
Meritt, Benjamin Dean, Ph.D., D.Litt., LL.D. Professor of Greek Epigraphy, Institute for Advanced Study, Princeton, N. J.	1938
Merriam, Charles Edward, Ph.D., LL.D. Professor of Political Science, University of Chicago. 6041 University Avenue, Chicago, Ill.	1935
Merriam, John C., B.S., Ph.D., Sc.D., LL.D. Paleontologist, President Emeritus, Carnegie Institution of Washington. California Institute of Technology, Pasadena, Calif.	1914

Date of Election

Merrill, Elmer Drew, B.S., M.S., Sc.D., LL.D. 1932
Professor of Botany, Administrator of Botanical Collections, Harvard University. Arnold Arboretum, Jamaica Plain, Mass.

Merrill, Paul Willard, Ph.D. 1939
Astronomer, Mount Wilson Observatory, Carnegie Institution of Washington, Pasadena, Calif.

Metz, Charles William, Ph.D. 1941
Professor of Zoology, Director, Zoological Laboratory, University of Pennsylvania, Philadelphia, Pa.

Miller, Gerrit Smith, Jr., A.B. 1927
Associate in Biology, United States National Museum, Washington, D. C.

Miller, Hunter, LL.B., LL.M., D.C.L. 1928
International Law, Editor of *The Treaties*, Department of State. Craiglands, R. M. D. 1, Victoria, B. C., Canada.

Miller, John Anthony, A.M., Ph.D., LL.D. 1915
Professor Emeritus of Astronomy, Director Emeritus, Sproul Observatory, Swarthmore College. Wallingford, Pa.

Millikan, Robert Andrews, Ph.D., LL.D., Sc.D. 1914
Director, Norman Bridge Laboratory of Physics, Chairman, Executive Council, California Institute of Technology, Pasadena, Calif.

Minot, George Richards, A.B., M.D., S.D. 1935
Professor of Medicine, Harvard University; Director, Thorndike Memorial Laboratory, and Visiting Physician, Boston City Hospital, Boston, Mass.

†Mitchell, Howard Hawks, Ph.D. 1925
Professor of Mathematics, University of Pennsylvania. 416 Sycamore Avenue, Merion, Pa.

Mitchell, Samuel Alfred, Ph.D., LL.D. 1923
Professor of Astronomy, Director, Leander McCormick Observatory, University of Virginia, University, Va.

† Deceased March 13, 1943.

	Date of Election
Mitchell, Wesley Clair, A.B., Ph.D., LL.D., D.Litt. Professor of Economics, Columbia University; Director of Research, National Bureau of Economic Research. 2 Horatio Street, New York, N. Y.	1931
Montgomery, James Alan, Ph.D., S.T.D., Litt.D., D.H.L. Philologist, Formerly Director and President, American Schools of Oriental Research; Professor Emeritus of Hebrew, Graduate School, University of Pennsylvania. 6806 Greene Street, Germantown, Philadelphia, Pa.	1925
Moore, George Thomas, A.M., Ph.D. Botanist, Director, Missouri Botanical Garden, St. Louis, Mo.	1905
Moore, J. Percy, Ph.D. Professor Emeritus of Zoology, University of Pennsylvania, Philadelphia, Pa.	1918
Moore, John Bassett, LL.D. International Law, Diplomatist, Member, Permanent Court of Arbitration (1912–28); Judge, Permanent Court of International Justice (1921–28). 960 Park Avenue, New York, N. Y.	1907
Morey, Charles Rufus, A.M., L.H.D. Litt.D. Marquand Professor of Art and Archaeology, Princeton University, Princeton, N. J.	1938
Morgan, Marshall S., A.B. President, Fidelity-Philadelphia Trust Company. R.F.D. 2, Malvern, Pa.	1933
Morgan, Thomas Hunt, B.S., Ph.D., D.Sc., LL.D. Zoologist, Director, Kerckhoff Laboratories of Biological Sciences, California Institute of Technology, Pasadena, Calif.	1915
Morison, Samuel Eliot, Ph.D., M.A., Litt.D. Professor of History, Harvard University. 2561 Washington Street, Canton, Mass.	1937
Morley, Sylvanus Griswold, Ph.D. In Charge, Carnegie Institution of Washington Archaeological Expeditions to Central America; Director, Chichen Itza Project. Apartado Postal 385, Merida, Yucatan, Mexico.	1940

	Date of Election
Morris, Harrison Smith Author, Formerly Managing Director, Pennsylvania Academy of the Fine Arts. Pear Hill, Chelton Avenue and York Road, Philadelphia, Pa.	1899
Morris, Lawrence J., A.B. Man of Affairs, Secretary, Pennsylvania Hospital. 240 South 4th Street, Philadelphia, Pa.	1936
Morris, Roland S., A.B., LL.B., LL.D., D.C.L., L.H.D. Lawyer, Diplomatist, Professor of International Law, University of Pennsylvania; United States Ambassador to Japan (1917–21). 1617 Land Title Building, Philadelphia, Pa.	1922
Morse, Marston, Ph.D., Sc.D. Professor of Mathematics, Institute for Advanced Study, Princeton, N. J.	1936
Moulton, Forest Ray, A.B., Ph.D., Sc.D., LL.D. Mathematician, Astronomer, Permanent Secretary, American Association for the Advancement of Science, Smithsonian Institution Building, Washington, D. C.	1916
Moulton, Harold Glenn, Ph.D., LL.D. Economist, President, The Brookings Institution, 722 Jackson Place, N. W., Washington, D. C.	1938
Mulliken, Robert Sanderson, B.S., Ph.D., Sc.D. Professor of Physics, University of Chicago, Chicago, Ill.	1940
Mumford, Lewis Author. Amenia, N. Y.	1941
Murlin, John Raymond, B.S., A.M., Ph.D., Sc.D. Professor of Physiology, Director, Department of Vital Economics, University of Rochester, 260 Crittenden Boulevard, Rochester, N. Y.	1932
Murnaghan, Francis Dominic, M.A., Ph.D. Professor of Applied Mathematics, Chairman of the Department of Mathematics, Johns Hopkins University. 6202 Sycamore Road, Baltimore, Md.	1942

	Date of Election
von Neumann, John, Ph.D., C.E. Professor of Mathematics, Institute for Advanced Study. 26 Westcott Road, Princeton, N. J.	1938
Nicolson, Marjorie Hope, Ph.D., Litt.D., L.H.D., LL.D. Professor of English, Columbia University, New York, N. Y.	1941
Nitze, William Albert, Ph.D., L.H.D. Professor Emeritus of Romance Languages and Literatures, University of Chicago. 557 Kelton Avenue, Los Angeles, Calif.	1936
Nock, Arthur Darby, LL.D. Frothingham Professor of the History of Religion, Harvard University. K21 Eliot House, Cambridge, Mass.	1941
Norris, George William, B.A., M.D. Physician, Author, Chief, Medical Service "A," Pennsylvania Hospital. Dimock, Susquehanna County, Pa.	1922
Northrop, John Howard, M.A., Ph.D., D.Sc., LL.D. Biochemist, Rockefeller Institute for Medical Research, Princeton, N. J.	1938
Novy, Frederick G., Sc.D., M.D., LL.D. Dean Emeritus, Medical School, Professor Emeritus of Bacteriology, University of Michigan, Ann Arbor, Mich.	1934
Ogburn, William Fielding, Ph.D., LL.D. Sewell L. Avery Distinguished Service Professor of Sociology, University of Chicago. 5525 Woodlawn Avenue, Chicago, Ill.	1940
Olivier, Charles P., M.A., Ph.D. Professor of Astronomy, Director, Flower Observatory, University of Pennsylvania, Upper Darby, Pa.	1932
O'Neill, Eugene Gladstone, Litt.D. Author, Playwright. Danville, Contra Costa County, Calif.	1935
Osgood, William Fogg, A.M., Ph.D., LL.D. Professor Emeritus of Mathematics, Harvard University. 10 Dorset Road, Belmont, Mass.	1915
Osterhout, Winthrop John Vanleuven, A.M., Ph.D., Sc.D. Physiologist, Rockefeller Institute for Medical Research, 66th Street and York Avenue, New York, N. Y.	1917

Date of Election

Packard, Francis Randolph, M.D., LL.D. 1933
Physician, Author. 304 South 19th Street,
Philadelphia, Pa.

Painter, Theophilus Shickel, Ph.D., Sc.D. 1939
Professor of Zoology, University of Texas.
610 West 33rd Street, Austin, Texas.

Parker, George Howard, Sc.D. 1911
Professor Emeritus of Zoology, Harvard University.
16 Berkeley Street, Cambridge, Mass.

Patterson, Ernest Minor, A.B., A.M., Ph.D., LL.D. 1932
Professor of Economics, University of Pennsylvania.
404 South 47th Street, Philadelphia, Pa.

Patterson, Lamar Gray 1898
Chemist. Perdido Beach, Ala.

Pauling, Linus Carl, Ph.D., Sc.D. 1936
Professor of Chemistry, Chairman, Division of Chemistry
and Chemical Engineering, Director, Gates and Crellin
Laboratories of Chemistry, California Institute of
Technology, Pasadena, Calif.

Pender, Harold, A.B., Ph.D., Sc.D. 1917
Dean, Moore School of Electrical Engineering,
University of Pennsylvania; Consulting Engineer.
200 South 33rd Street, Philadelphia, Pa.

Pepper, George Wharton, B.A., LL.B., LL.D., D.C.L. 1897
Lawyer, United States Senator (1922–27);
Formerly Professor of Law, University of Pennsylvania.
2231 Land Title Building, Philadelphia, Pa.

Pepper, William, A.B., M.D., Sc.D., LL.D. 1937
Dean, School of Medicine, University of Pennsylvania.
Prospect Avenue, Melrose Park, Philadelphia, Pa.

Perry, Ralph Barton, Ph.D., Litt.D., L.H.D. 1939
Professor of Philosophy, Harvard University.
445 Widener Library, Cambridge, Mass.

Phelps, William Lyon, Ph.D., Litt.D., L.H.D., LL.D., D.D., D.S.T. 1927
Author, Professor Emeritus of English Literature,
Yale University. 110 Whitney Avenue, New Haven, Conn.

	Date of Election
Pound, Roscoe, Ph.D., LL.D., J.U.D., L.H.D. University Professor at Harvard. 304 School Street, Watertown, Mass.	1940
Prince, John Dyneley, B.A., Ph.D. Orientalist and Comparative Philologist, Professor Emeritus of East European Languages, Philosophy Hall, Columbia University, New York, N. Y.	1913
Putnam, Herbert, Litt.D., LL.D. Librarian Emeritus of Congress, Washington, D. C.	1937
Quinn, Arthur Hobson, Ph.D., Litt.D. John Welch Centennial Professor of History and English Literature, University of Pennsylvania. 401 Pembroke Road, Bala-Cynwyd, Pa.	1940
Rabi, Isidor Isaac, Ph.D. Professor of Physics, Columbia University. Massachusetts Institute of Technology, Cambridge, Mass.	1941
Rand, Edward Kennard, A.B., A.M., Ph.D., Litt.D., LL.D. Professor Emeritus of Latin, Harvard University. 107 Lake View Avenue, Cambridge, Mass.	1925
Ravenel, Mazÿck P., M.D. Physician, Editor-in-Chief, *American Journal of Public Health.* University of Missouri, Columbia, Mo.	1901
Read, Conyers, A.M., Ph.D., B.Litt., Litt.D. Professor of English History (on leave of absence), University of Pennsylvania. 1520 Locust Street, Philadelphia, Pa.	1934
Reid, Harry Fielding, C.E., A.B., Ph.D. Professor Emeritus of Dynamical Geology and Geography, Johns Hopkins University, Baltimore, Md.	1910
Repplier, Agnes, Litt.D. Author. 920 Clinton Street, Philadelphia, Pa.	1928
Rhoads, Charles James, A.B. Banker (ret.), Trustee, Bryn Mawr College, Haverford College. Bryn Mawr, Pa.	1921

Date of Election

Richards, Alfred Newton, Ph.D., Sc.D., M.D., LL.D. 1935
Professor of Pharmacology, University of Pennsylvania.
6 Rugby Road, Bryn Mawr, Pa.

Richards, Horace Clark, A.B., Ph.D. 1907
Professor Emeritus of Mathematical Physics,
University of Pennsylvania.
509 Woodland Terrace, Philadelphia, Pa.

Richter, Gisela Marie Augusta, Litt.D., M.A., L.H.D., D.F.A. 1942
Archaeologist, Curator, Greek and Roman Department,
Metropolitan Museum of Art. 1170 Fifth Avenue,
New York, N. Y.

Riddle, Oscar, A.B., Ph.D., LL.D. 1926
Physiologist, Carnegie Institution, Station for
Experimental Evolution, Cold Spring Harbor,
Long Island, N. Y.

Rivers, Thomas Milton, M.D., Sc.D. 1942
Physician, Director, Hospital of the Rockefeller
Institute for Medical Research.
163 Greenway South, Forest Hills, L. I., N. Y.

Robbins, William Jacob, Ph.D., Sc.D. 1941
Professor of Botany, Columbia University;
Director, New York Botanical Garden,
Bronx Park, New York, N. Y.

Roberts, Owen J., A.B., LL.B., LL.D., D.C.L. 1934
Associate Justice, Supreme Court of the United States,
Washington, D. C.

Robertson, Howard Percy, Ph.D. 1940
Professor of Mathematical Physics, Princeton
University. 175 Prospect Avenue, Princeton, N. J.

Robinson, David Moore, Ph.D., LL.D., L.H.D., Litt.D. 1936
Professor of Archaeology and Epigraphy, Lecturer in
Greek Literature, Johns Hopkins University,
Baltimore, Md.

Rockefeller, John D., Jr., A.B., A.M. 1931
Administrator, Trustee, Rockefeller Institute for Medical
Research. 30 Rockefeller Plaza, New York, N. Y.

Date of Election

Rogers, Lindsay, Ph.D., LL.B. 1941
Burgess Professor of Public Law, Columbia University.
175 Riverside Drive, New York, N. Y.

†Rolfe, John Carew, Ph.D., Litt.D. 1907
Professor Emeritus of Latin, University of Pennsylvania.
1198 Janney's Lane, Alexandria, Va.

Rosenbach, A. S. W., B.S., Ph.D., D.F.A. 1928
Author, Bibliographer, President, Gratz College.
1320 Walnut Street, Philadelphia, Pa.

Rosengarten, Adolph G., B.S. 1940
Man of Affairs, Trustee, University of Pennsylvania,
Lankenau Hospital. St. Davids, Pa.

Rostovtzeff, Michael I., Ph.D., LL.D. 1929
Director of Archaeological Research, Yale University.
470 Whitney Avenue, New Haven, Conn.

Rous, Peyton, M.D., D.Sc. 1939
Member, Rockefeller Institute for Medical Research.
125 East 72nd Street, New York, N. Y.

Rowe, Leo S., A.B., LL.B., Ph.D., LL.D. 1911
Director General, Pan-American Union,
Washington, D. C.

Russell, Henry Norris, A.M., Ph.D., D.Sc. 1913
Professor of Astronomy, Director, Princeton University
Observatory. 79 Alexander Street, Princeton, N. J.

Ruthven, Alexander G., B.S., Ph.D., LL.D., Sc.D. 1931
Zoologist, President, University of Michigan,
Ann Arbor, Mich.

Sanders, Henry A., A.B., A.M., Ph.D., L.H.D. 1932
Professor Emeritus of Latin, University of Michigan.
2037 Geddes Avenue, Ann Arbor, Mich.

Sarton, George, D.Sc., L.H.D., LL.D. 1934
Historian of Science, Editor of *Isis*.
Harvard Library 185, Cambridge, Mass.

Scattergood, J. Henry, A.B. 1931
Man of Affairs, Treasurer, Haverford College,
Bryn Mawr College. Villa Nova, Pa.

† Deceased March 27, 1943

Date of Election

Schaeffer, J. Parsons, A.M., M.D., Ph.D., Sc.D. 1927
Professor of General Anatomy, Director, Daniel Baugh Institute of Anatomy, Jefferson Medical College. 4634 Spruce Street, Philadelphia, Pa.

Schelling, Felix E., Ph.D., Litt.D., LL.D. 1902
Professor Emeritus of English Literature, University of Pennsylvania. 251 Claremont Avenue, Mount Vernon, N. Y.

Schlesinger, Arthur Meier, Ph.D., Litt.D., L.H.D. 1941
Francis Lee Higginson Professor of History, Harvard University. 19 Gray Gardens East, Cambridge, Mass.

Schlesinger, Frank, B.S., M.A., Ph.D., Sc.D. 1912
Director Emeritus, Yale University Observatory. Lyme, Conn.

Schmitt, Bernadotte Everly, M.A. (Oxon.), Ph.D., LL.D., Litt.D. 1942
Andrew MacLeish Distinguished Service Professor of Modern History, University of Chicago; Editor, *Journal of Modern History.* 1126 East 59th Street, Chicago, Ill.

Schramm, Jacob Richard, A.B., Ph.D. 1932
Professor of Botany, Director, Department of Botany, Director, Morris Arboretum, University of Pennsylvania, Philadelphia, Pa.

Schultz, Adolph H., Ph.D. 1936
Associate Professor of Physical Anthropology, School of Medicine, Johns Hopkins University, Baltimore, Md.

Schuyler, Robert Livingston, Ph.D., L.H.D. 1942
Gouverneur Morris Professor of History, Columbia University. 1170 Fifth Avenue, New York, N. Y.

Scott, James Brown, A.B., A.M., J.U.D., LL.D. 1930
Secretary Emeritus, Carnegie Endowment for International Peace. Wardour, Annapolis, Md.

Scott, John Morin, A.B. 1926
Lawyer. 1903 Spruce Street, Philadelphia, Pa.

Scott, William Berryman, M.A., Ph.D., Sc.D., LL.D. 1886
Blair Professor Emeritus of Geology, Princeton University. 7 Cleveland Lane, Princeton, N. J.

	Date of Election
Seares, Frederick Hanley, B.S., LL.D. Astronomer, Assistant Director, Mount Wilson Observatory, Pasadena, Calif.	1917
See, Thomas Jefferson Jackson, A.M., Lt.M., Sc.M., Ph.D., D.Sc. Physicist, Astronomer, Geometer, Professor of Mathematics, United States Navy (ret.). 614 Ohio Street, Vallejo, Calif.	1897
Setchell, William Albert, A.M., Ph.D. Professor Emeritus of Botany, University of California. 2441 Haste Street, Berkeley, Calif.	1919
Seymour, Charles, Ph.D., Litt.D., LL.D., L.H.D. President, Yale University. 43 Hillhouse Avenue, New Haven, Conn.	1939
Shapley, Harlow, A.M., Ph.D., LL.D., Sc.D., D.Hon.Caus., Litt.D. Astronomer, Director, Harvard College Observatory, Cambridge, Mass.	1922
Shear, Theodore Leslie, Ph.D., L.H.D. Professor of Classical Archaeology, Princeton University, Princeton, N. J.	1939
Shotwell, James Thomson, Ph.D., LL.D. Professor of History, Columbia University; Trustee and Director, Division of Economics and History, Carnegie Endowment for International Peace. 405 West 117th Street, New York, N. Y.	1936
Shull, George Harrison, B.S., Ph.D., Sc.D., LL.D. Professor of Botany and Genetics, Princeton University. 60 Jefferson Road, Princeton, N. J.	1918
Simpson, George Gaylord, Ph.D. Curator of Fossil Mammals, American Museum of Natural History, New York, N. Y.	1936
Singer, Edgar Arthur, Jr., B.S., Ph.D. Professor of Philosophy, University of Pennsylvania. 4224 Chester Avenue, Philadelphia, Pa.	1925

Date of Election

Sinnott, Edmund Ware, Ph.D. 1939
Sterling Professor of Botany, Yale University,
New Haven, Conn.

Sioussat, St. George Leakin, Ph.D. 1928
Chief, Division of Manuscripts, Incumbent, Chair of
American History, Library of Congress,
Washington, D. C.

Slater, John Clarke, Ph.D. 1940
Professor of Physics, Massachusetts Institute of
Technology, Cambridge, Mass.

Slipher, Vesto Melvin, A.M., Ph.D., LL.D., Sc.D. 1921
Astronomer, Director, Lowell Observatory,
Flagstaff, Ariz.

Smyth, Charles Phelps, Ph.D. 1932
Professor of Chemistry, Princeton University.
22 Morven Street, Princeton, N. J.

Speiser, Ephraim Avigdor, M.A., Ph.D. 1941
Professor of Semitics, University of Pennsylvania.
7601 West Avenue, Elkins Park, Pa.

Spoehr, Herman Augustus, Ph.D., Sc.D. 1931
Chairman, Division of Plant Biology, Carnegie Institution
of Washington, Stanford University, Calif.

Sprague, Oliver Mitchell Wentworth, A.M., Ph.D., Litt.D. 1938
Edmund Cogswell Converse Professor of Banking and
Finance, Harvard Graduate School of Business,
Soldier's Field, Boston, Mass.

Stadler, Lewis John, Ph.D. 1941
Professor of Field Crops, University of Missouri;
Principal Geneticist, Bureau of Plant Industry,
United States Department of Agriculture.
308 Thilly Avenue, Columbia, Mo.

Stakman, Elvin Charles, Ph.D., Dr.Nat.Science 1940
Professor and Chief, Division of Plant Pathology and
Botany, University of Minnesota Experiment Station;
Agent, United States Department of Agriculture.
University Farm, St. Paul, Minn.

Date of Election

Stanley, Wendell Meredith, Ph.D., Sc.D. 1940
Biochemist, Member, Rockefeller Institute
for Medical Research, Princeton, N. J.

Stebbins, Joel, Ph.D., Sc.D., LL.D. 1925
Professor of Astronomy, Director, Washburn Observatory,
University of Wisconsin, Madison, Wis.

Stefansson, Vilhjalmur, Ph.D., LL.D. 1923
Arctic Explorer, Geographer and Adviser on Northern
Operations to Pan-American Airways.
67 Morton Street, New York, N. Y.

Stone, Harlan Fiske, LL.B., LL.D. 1939
Chief Justice, Supreme Court of the United
States. 2340 Wyoming Avenue, Washington, D. C.

Struve, Otto, Ph.D., Sc.D. 1937
Professor of Astrophysics, University of Chicago;
Director, Yerkes Observatory, Williams Bay, Wis.

Sturtevant, Alfred Henry, Ph.D. 1936
Professor of Genetics, California Institute of Technology,
Pasadena, Calif.

Sturtevant, Edgar Howard, Ph.D., L.H.D., LL.D. 1939
Professor of Linguistics, Yale University.
408 Whitney Avenue, New Haven, Conn.

Sumner, Francis Bertody, Ph.D. 1938
Professor of Biology, Scripps Institution of Oceanography,
University of California, La Jolla, Calif.

Swann, William Francis Gray, M.A., D.Sc. 1926
Physicist, Director, Bartol Research Foundation,
Whittier Place, Swarthmore, Pa.

Taliaferro, William Hay, Ph.D. 1941
Eliakim H. Moore Distinguished Service Professor of
Parasitology, Chairman, Department of Bacteriology
and Parasitology, Dean, Division of Biological Sciences,
University of Chicago. 950 East 59th Street,
Chicago, Ill.

Date of Election

Tate, John Torrence, Ph.D., D.Sc. 1941
Professor of Physics, Dean, College of Science, Literature and the Arts, University of Minnesota. 1943 East River Road, Minneapolis, Minn.

Tatlock, J. S. P., Ph.D., Litt.D., LL.D. 1937
Professor of English, University of California. 1994 San Antonio Street, Berkeley, Calif.

Taylor, Deems, A.B., Mus.D., Litt.D. 1934
Musician, Composer, Writer. The Haviland Road, Stamford, Conn.

Taylor, Hugh Stott, D.Sc., LL.D. 1928
David B. Jones Professor of Chemistry, Princeton University, Princeton, N. J.

Thorndike, Edward L., A.B., A.M., Ph.D., Sc.D., LL.D. 1932
Professor Emeritus of Educational Psychology, Teachers College, Columbia University, New York, N. Y.

Thorndike, Lynn, Ph.D., L.H.D. 1939
Professor of History, Columbia University, New York, N. Y.

Timoshenko, Stephen P., D.Sc. 1939
Professor of Theoretical and Applied Mechanics, Stanford University. 536 West Crescent Drive, Palo Alto, Calif.

Tolman, Richard Chace, Ph.D. 1932
Professor of Physical Chemistry and Mathematical Physics, California Institute of Technology, Pasadena, Calif.

Tozzer, Alfred Marston, A.B., A.M., Ph.D. 1937
Professor of Anthropology, Harvard University. 7 Bryant Street, Cambridge, Mass.

Trelease, William, Sc.D., LL.D. 1903
Professor Emeritus of Botany, University of Illinois, Urbana, Ill.

Tucker, Richard Hawley, C.E., Sc.D. 1908
Astronomer, Formerly of Lick Observatory. 1525 Waverly Street, Palo Alto, Calif.

Date of Election

Tyzzer, Ernest Edward, Ph.B., A.M., M.D., Sc.D. 1931
Professor of Comparative Pathology and Tropical Medicine, Harvard Medical School.
175 Water Street, Wakefield, Mass.

Urey, Harold Clayton, Ph.D., D.Sc., N.L. 1935
Professor of Chemistry, Executive Officer of the Department, Columbia University.
355 Highwood Avenue, Leonia, N. J.

Van Doren, Carl 1942
Author and Historian
41 Central Park West, New York, N. Y.

Van Vleck, John Hasbrouck, Ph.D. 1939
Professor of Mathematical Physics, Harvard University, Cambridge, Mass.

Van Slyke, Donald Dexter, Ph.D., Sc.D., M.D. 1938
Biochemist, Rockefeller Institute for Medical Research, 66th Street and York Avenue, New York, N. Y.

Vaughan, Thomas Wayland, B.Sci., A.M., Ph.D., LL.D. 1923
Director Emeritus, Scripps Institution of Oceanography; Principal Scientist (ret.), United States Geological Survey; Associate in Paleontology, United States National Museum. 3333 P Street, Washington, D. C.

Veblen, Oswald, A.B., Ph.D., D.Sc. 1912
Professor of Mathematics, Institute for Advanced Study.
58 Battle Road, Princeton, N. J.

Viner, Jacob, Ph.D. 1942
Professor of Economics, University of Chicago.
5554 Kenwood Avenue, Chicago, Ill.

Warren, Charles, A.B., A.M., LL.D. 1939
Lawyer. 1527 Eighteenth Street, Washington, D. C.

Warren, Charles Hyde, Ph.B., Ph.D. 1928
Dean, Sheffield Scientific School, Professor of Geology, Yale University. 100 High Street, New Haven, Conn.

Webster, David Locke, A.B., Ph.D. 1922
Professor and Executive Head, Department of Physics, Stanford University, Calif.

Date of Election

Weed, Lewis Hill, M.D., ScD., LL.D. 1942
Professor of Anatomy, Director, School of Medicine, Johns Hopkins University.
3908 North Charles Street, Baltimore, Md.

Wertenbaker, Thomas Jefferson, B.A., M.A., Ph.D., L.H.D., Litt.D. 1941
Edwards Professor of American History, Princeton University. 164 Prospect Avenue, Princeton, N. J.

Westergaard, Harald Malcolm, B.S., Ph.D., Dr.Ing., Dr.Tech., Sc.D. 1942
Gordon McKay Professor of Civil Engineering, Dean. Graduate School of Engineering, Harvard University, Pierce Hall, Cambridge, Mass.

Wetherill, Samuel Price, B.S., LL.D. 1933
Engineer. 1203 Morris Building, Philadelphia, Pa.

Wetmore, Alexander, A.B., M.S., Ph.D., D.Sc. 1930
Zoologist, Assistant Secretary, Smithsonian Institution; In Charge, United States National Museum, Washington, D. C.

Weyl, Hermann, Ph.D., D.Eng., D.Sc. 1935
Professor of Mathematics, Institute for Advanced Study, Princeton, N. J.

Whipple, George Hoyt, M.D., M.A., D.Sc., LL.D. 1938
Professor of Pathology, Dean, School of Medicine and Dentistry, University of Rochester.
320 Westminster Road, Rochester, N. Y.

Whitney, Willis R., S.B., Ph.D., Sc.D., Ch.D., LL.D. 1931
Chemist, Honorary Vice-president, General Electric Company, Schenectady, N. Y.

Williams, John Henry, Ph.D., Sc.D. 1942
Nathaniel Ropes Professor of Political Economy, Dean, Graduate School of Public Administration, Harvard University; Vice-president, Federal Reserve Bank of New York. 148 Coolidge Hill, Cambridge, Mass.

Williams, Robert R., M.S., D.Sc. 1942
Chemical Director, Bell Telephone Laboratories.
297 Summit Avenue, Summit, N. J.

	Date of Election
Willis, Bailey, E.M., C.E., Ph.D. Professor Emeritus of Geology, Stanford University. Box 1365, Stanford University, Calif.	1905
Willits, Joseph Henry, A.M., Ph.D., LL.D. Director for the Social Sciences, Rockefeller Foundation, 49 West 49th Street, New York, N. Y.	1938
Wilson, Edwin Bidwell, A.B., Ph.D. Professor of Vital Statistics, Harvard School of Public Health. 55 Shattuck Street, Boston, Mass.	1917
Wilson, George Grafton, Ph.D., LL.D. Professor Emeritus of International Law, Langdell Hall, Harvard University, Cambridge, Mass.	1936
Wilson, Harold Albert, M.A., M.Sc., D.Sc. Professor of Physics, The Rice Institute, Houston, Texas	1914
Winlock, Herbert Eustis, Art.D., Litt.D. Director Emeritus and Formerly Curator, Egyptian Department, Metropolitan Museum of Art. 1010 Fifth Avenue, New York, N. Y.	1939
Wissler, Clark, A.M., Ph.D., LL.D. Curator of Anthropology, American Museum of Natural History, New York, N. Y.	1924
Witmer, Lightner, A.M., Ph.D. Professor Emeritus of Psychology, University of Pennsylvania. Box 186, Devon, Pa.	1897
Wolman, Leo, Ph.D. Professor of Economics, Columbia University. National Bureau of Economic Research, 1819 Broadway, New York, N. Y.	1941
Woodworth, Robert Sessions, A.B., A.M., Ph.D., Sc.D., LL.D. Professor Emeritus of Psychology, Columbia University, New York, N. Y.	1936
Wright, Frederick E., Ph.D. Petrologist, Geophysical Laboratory, Carnegie Institution of Washington. 2134 Wyoming Avenue, Washington, D. C.	1914

Date of Election

Wright, Sewall, B.S., M.S., Sc.D. 1932
Ernest D. Burton Distinguished Service
Professor of Zoology, University of Chicago.
5762 Harper Avenue, Chicago, Ill.

Wright, William Hammond, D.Sc. 1935
Astronomer, Director (ret.), Lick Observatory,
Mount Hamilton, Calif.

Yeatman, Pope, E.M., D.E. 1920
Mining Engineer. 165 Broadway, New York, N. Y.

Yerkes, Robert Mearns, Ph.D., D.Sc., LL.D. 1936
Professor of Psychobiology, Yale University,
333 Cedar Street, New Haven, Conn.

Young, James Thomas, Ph.D. 1933
Political Scientist, Professor of Public Administration,
University of Pennsylvania, Philadelphia, Pa.

Young, Owen D., A.B., D.H.L., LL.B., Litt.D., D.C.S. 1929
Lawyer, Honorary Chairman, General Electric Company.
570 Lexington Avenue, New York, N. Y.

Zeleny, John, M.A., Ph.D. 1915
Professor Emeritus of Physics, Yale University.
44 Cold Spring Street, New Haven, Conn.

Total Resident Members—467.

December 31, 1942.

FOREIGN MEMBERS

	Date of Election
Adams, Frank Dawson, Ph.D., D.Sc., LL.D., F.R.S. Geologist. 1173 Mountain Street, Montreal, Canada.	1916
Adrian, Edgar Douglas, M.A., M.D., Sc.D., LL.D., F.R.S. Professor of Physiology, Cambridge University. St. Chad's, Grange Road, Cambridge, England.	1938
Alonso, Amado, Ph.D., LL.D. Director, Instituto de Filología, and Professor, University of Buenos Aires, Buenos Aires, Argentina.	1942
Bell, Harold Idris, D.Litt., F.B.A., F.S.A. Keeper of the Manuscripts and Egerton Librarian, British Museum, London, W.C.1, England.	1941
Beneš, Eduard, Ph.D., LL.D. Formerly President, Czechoslovak Republic.	1939
Bohr, Niels Henrik David, Dr.phil. Professor of Theoretical Physics, University of Copenhagen; Director, Institute of Theoretical Physics. G. 1 Carlsberg, Copenhagen, Denmark.	1940
de Broglie, Prince Louis Victor, D.Sc. Professor of Theoretical Physics, University of Paris. 94 Rue Perronet, Neuilly-sur-Seine, France.	1939
Craigie, Sir William A., LL.D., D.Litt. Professor Emeritus of English, University of Chicago. Ridgehurst, Watlington, Oxford, England.	1942
Cumont, Franz Valery Marie, D.Litt. Authority on Religions of the Roman Empire. 19 Corso d'Italia, Rome, Italy.	1940
Dale, Sir Henry Hallett, M.D., D.Sc., LL.D., F.R.S. Director, National Institute for Medical Research. Mt. Vernon House, Hampstead, London, N.W.3, England.	1939
Debye, Peter Chairman of the Department of Chemistry and Professor of Chemistry, Cornell University, Ithaca, N. Y.	1936

Date of Election

Dirac, Paul Adrien Maurice, Ph.D., F.R.S. 1938
Lucasian Professor of Mathematics, Cambridge University.
St. John's College, Cambridge, England.

Eddington, Sir Arthur Stanley, M.A., B.Sc., D.Sc., LL.D., F.R.S. 1931
Astronomer, Director, The Observatory,
Cambridge, England.

Fisher, Ronald Aylmer, Sc.D., LL.D., F.R.S. 1941
Galton Professor of Eugenics, University College, London.
The Galton Laboratory, Rothamsted Experimental Station,
Harpenden, Hertfordshire, England.

Gooch, George Peabody, D.Litt. 1939
Honorary Fellow, Trinity College, Cambridge University.
76 Campden Hill Road, London, W.8, England.

Hardy, Godfrey Harold, D.Sc., LL.D., D.Phil. 1939
Sadleirian Professor of Pure Mathematics, University of
Cambridge; Fellow, Trinity College, Cambridge, England.

Heckscher, Eli Filip, Ph.D., D.Sc. 1940
Research Professor of Economic History, University of
Stockholm. Baldersgatan 10 a, Stockholm, Sweden.

Heisenberg, Werner, Ph.D. 1937
Professor of Theoretical Physics, University of Leipzig.
Bozenerweg 14, Leipzig, Germany.

Hertzsprung, Ejnar 1941
Director, Leiden Observatory, Leiden, Netherlands.

†Hilbert, David 1932
Professor of Mathematics, University of Göttingen.
Wilhelm-Weber-Strasse, Göttingen, Germany.

Hill, Archibald Vivian, Sc.D., LL.D., M.D. 1938
Physiologist, Foulerton Research Professor and Secretary
of the Royal Society. University of London, University
College, Gower Street, London, W.C.1, England.

Hjort, Johan, Ph.D., Sc.D. 1939
Professor of Marine Biology, Oslo University,
Oslo, Norway.

† Deceased February 18, 1943.

	Date of Election
Hopkins, Sir Frederick Gowland, M.A., M.B., D.Sc., LL.D., D.C.L., F.R.S. Physiologist, Professor of Biochemistry, University of Cambridge. Saxmeadham, Grange Road, Cambridge, England.	1937
Hu Shih, Ph.D., LL.D., Litt.D., L.H.D., D.C.L. Retired Chinese Ambassador to United States. 104 East 81st Street, New York, N. Y.	1936
Irvine, Sir James Colquhoun, C.B.E., Ph.D., Sc.D., LL.D., D.C.L., F.R.S. Chemist, Principal and Vice-chancellor, University of St. Andrews, Fifeshire, Scotland.	1933
Janet, Pierre, Dr. ès lettres, Dr. en médicine, Sc.D. Professor of Psychology, Collège de France; Director, Laboratoire de Psychologie pathologique, Clinique de la Salpêtrière. Rue de Varenne 54, Paris VII, France.	1940
Jones, Harold Spencer, Sc.D., F.R.S. Astronomer Royal of Great Britain. Flamsteed House, Greenwich Park, S.E. 10, England.	1942
Keith, Sir Arthur, Kt., F.R.S., M.D., D.Sc., F.R.C.S., LL.D. Anthropologist, Master, Buckston Browne Research Farm, Downe, Farnborough, Kent, England.	1931
Keith, Arthur Berriedale, D.C.L., D.Litt., LL.D. Barrister at Law, Advocate and Orientalist, Regius Professor of Sanskrit and Comparative Philology, Lecturer on the Constitution of the British Empire, University of Edinburgh, Edinburgh, Scotland.	1935
Kenyon, Sir Frederic George, M.A., D.Litt., LL.D., L.H.D., Ph.D. Archaeologist and Philologist, Secretary, British Academy; Formerly President, London Society of Antiquaries; Formerly Director, British Museum. Kirkstead, Godstone, Surrey, England.	1937
Kramers, Hendrik Anthony, Dr. Professor of Theoretical Physics, University of Leiden, Leiden, Netherlands.	1942
Krogh, August, Ph.D., LL.D., M.D., Sc.D. Professor of Zoophysiology, Copenhagen University, Copenhagen, Denmark.	1941

Date of Election

de Margerie, Emmanuel 1932
Geologist, Formerly President, Geological Society of France. 110 Rue du Bac, Paris VII, France.

Méndez-Pereira, Octavio, Ph.D., LL.D. 1942
Formerly Rector, University of Panama; Apartado 320, Panamá, Republica de Panamá.

Nilsson, Martin P., Ph.D. 1939
Professor of Classical Archaeology and Ancient History, University of Lund. Bredgatan 25, Lund, Sweden.

Penck, Albrecht F. K., Ph.D., Sc.D. 1908
Professor Emeritus of Geography, University of Berlin. Meierottostrasse 511, Berlin W15, Germany.

Pidal, Ramón Menéndez, Dr. honoris causa 1940
Professor of Romance Philology, University of Madrid, Madrid, Spain.

Planck, Max, Ph.D., M.D., D.Sc. 1933
Professor of Physics, University of Berlin, Berlin, Germany.

Prain, Sir David, Kt., M.A., M.B., LL.D., F.R.S. 1917
Botanist, Formerly Trustee, British Museum and Director, Royal Botanic Gardens, Kew. The Well Farm, Whyteleafe, Surrey, England.

Rappard, William E., Dr.jur., Litt.D., LL.D. 1941
Professor of Public Finance and Political Science, University of Geneva; Director, Graduate Institute of International Studies, Geneva, Switzerland.

Richardson, Sir Owen Willans, Kt., M.A., D.Sc., LL.D., F.R.S. 1910
Physicist, Yarrow Research Professor of the Royal Society; Director of Research in Physics, Kings College, London. Chandos Lodge, Alton, Hants, England.

Rist, Charles, LL.D. 1938
Professor of Political Economy, University of Paris. 18 bis, Rue du Parc de Clagny, Versailles, France.

Stein, Sir Aurel, F.B.A., Ph.D., D.Litt., D. Sc., D.O.L. 1939
Archaeologist and Geographer. Srinagar, Kashmir.

	Date of Election
Svedberg, Theodor, Ph.D. Professor of Physical Chemistry, Upsala University, Upsala, Sweden.	1941
Tawney, Richard Henry Professor of Economic History, University of London; Attached to British Embassy, Washington, D. C.	1942
Thompson, Sir D'Arcy Wentworth, D.Litt., D.Sc., LL.D. Professor of Natural History, St. Andrews University, St. Andrews, Scotland.	1941
Toynbee, Arnold Joseph, D. Litt. Director of Studies, Royal Institute of International Affairs; Research Professor of International History, University of London, London, England.	1941
Vinogradov, Ivan Matveitch, Dr. Director, Steklov Institute of Mathematics of the Academy of Sciences of the U.S.S.R., Moscow, U.S.S.R.	1942
Wilkins, Sir Hubert, Kt., M.C., F.R.G.S., M.B.O.U. Consultant, Military Planning Division, U. S. Army. City Club, 55 West 44th Street, New York, N. Y.	1930
van Zeeland, Paul Formerly Prime Minister and Minister of Foreign Affairs and of Foreign Commerce of Belgium. Co-ordinating Foundation, 30 Rockefeller Plaza, New York, N. Y.	1942

Total Foreign Members—50.

December 31, 1942.

CLASSIFIED LIST OF MEMBERS

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

Mathematics

Alexander, James W. .... Princeton, N. J.
Bateman, Harry .... Pasadena, Calif.
Bell, Eric Temple .... Pasadena, Calif.
Birkhoff, George David .... Cambridge, Mass.
Bliss, Gilbert Ames .... Chicago, Ill.
Coble, Arthur Byron .... Urbana, Ill.
Dirac, Paul Adrien Maurice .... Cambridge, England
Dresden, Arnold .... Swarthmore, Pa.
Eisenhart, Luther Pfahler .... Princeton, N. J.
Evans, Griffith Conrad .... Berkeley, Calif.
Fisher, Ronald Aylmer .... Harpenden, Hertfordshire, England
Hardy, Godfrey Harold .... Cambridge, England
†Hilbert, David .... Göttingen, Germany
Huntington, Edward Vermilye .... Cambridge, Mass.
Kline, John Robert .... Swarthmore, Pa.
Lefschetz, Solomon .... Princeton, N. J.
Lovett, Edgar Odell .... Houston, Texas
†Mitchell, Howard Hawks .... Merion, Pa.
Morse, Marston .... Princeton, N. J.
Murnaghan, Francis Dominic .... Baltimore, Md.
von Neumann, John .... Princeton, N. J.
Osgood, William Fogg .... Belmont, Mass.
Veblen, Oswald .... Princeton, N. J.
Vinogradov, Ivan M. .... Moscow, Russia
Weyl, Hermann .... Princeton, N. J.

Astronomy

Abbot, Charles Greeley .... Washington, D. C.
Adams, Walter Sydney .... Pasadena, Calif.
Aitken, Robert Grant .... Berkeley, Calif.
Douglass, Andrew Ellicott .... Tucson, Ariz.

† Deceased.

Eddington, Arthur Stanley..................Cambridge, England
Gaposchkin, Cecilia Payne......................Cambridge, Mass.
Hertzsprung, Ejnar..........................Leiden, Netherlands
Hubble, Edwin P.............................Pasadena, Calif.
Jones, Harold Spencer................Greenwich Park, England
Lampland, Carl O..............................Flagstaff, Ariz.
Leuschner, Armin Otto.........................Berkeley, Calif.
McMath, Robert Raynolds.......................Pontiac, Mich.
Merrill, Paul Willard.........................Pasadena, Calif.
Miller, John Anthony.........................Wallingford, Pa.
Mitchell, Samuel Alfred.......................University, Va.
Moulton, Forest Ray.........................Washington, D. C.
Olivier, Charles P..........................Upper Darby, Pa.
Russell, Henry Norris........................Princeton, N. J.
Schlesinger, Frank.............................Lyme, Conn.
Seares, Frederick Hanley......................Pasadena, Calif.
Shapley, Harlow.............................Cambridge, Mass.
Slipher, Vesto Melvin.........................Flagstaff, Ariz.
Stebbins, Joel...............................Madison, Wis.
Struve, Otto...............................Williams Bay, Wis.
Tucker, Richard Hawley.......................Palo Alto, Calif.
Wright, William Hammond..................Mt. Hamilton, Calif.

Physics

Adams, Edwin Plimpton........................Princeton, N. J.
Anderson, Carl David.........................Pasadena, Calif.
Beams, Jesse Wakefield........................University, Va.
Bohr, Niels Henrik David.................Copenhagen, Denmark
Bowen, Ira Sprague...........................Pasadena, Calif.
Bridgman, Percy Williams....................Cambridge, Mass.
Briggs, Lyman J............................Washington, D. C.
de Broglie, Louis Victor...............Neuilly-sur-Seine, France
Buckley, Oliver Ellsworth....................New York, N. Y.
Compton, Arthur Holly..........................Chicago, Ill.
Compton, Karl Taylor........................Cambridge, Mass.
Coolidge, William David....................Schenectady, N. Y.
Crew, Henry..................................Evanston, Ill.
Darrow, Karl Kelchner........................New York, N. Y.
Davisson, Clinton J..........................New York, N. Y.
Debye, Peter..................................Ithaca, N. Y.
Dempster, Arthur Jeffrey.......................Chicago, Ill.
DuBridge, Lee Alvin...........................Belmont, Mass.
Einstein, Albert.............................Princeton, N. J.

Fermi, Enrico....New York, N. Y.
Foote, Paul Darwin....Pittsburgh, Pa.
Franck, James....Chicago, Ill.
Goodspeed, Arthur Willis....Hopkinton, N. H.
Heisenberg, Werner....Leipzig, Germany
Humphreys, William Jackson....Washington, D. C.
Ives, Herbert E....Montclair, N. J.
Kramers, Hendrik A....Leiden, Netherlands
Lawrence, Ernest Orlando....Berkeley, Calif.
Loomis, Alfred Lee....Tuxedo Park, N. Y.
Lyman, Theodore....Cambridge, Mass.
Magie, William Francis....Princeton, N. J.
Millikan, Robert Andrews....Pasadena, Calif.
Mulliken, Robert Sanderson....Chicago, Ill.
Planck, Max....Berlin, Germany
Rabi, Isidor Isaac....Cambridge, Mass.
Richards, Horace Clark....Philadelphia, Pa.
Richardson, Owen Willans....Alton, Hants, England
Robertson, Howard Percy....Princeton, N. J.
See, Thomas Jefferson Jackson....Vallejo, Calif.
Slater, John Clarke....Cambridge, Mass.
Swann, William Francis Gray....Swarthmore, Pa.
Tate, John Torrence....Minneapolis, Minn.
Tolman, Richard Chace....Pasadena, Calif.
Van Vleck, John Hasbrouck....Cambridge, Mass.
Webster, David Locke....Stanford University, Calif.
Wilson, Harold Albert....Houston, Texas
Zeleny, John....New Haven, Conn.

Chemistry

Adams, Roger....Urbana, Ill.
Andrews, Donald Hatch....Baltimore, Md.
Baekeland, Leo H....New York, N. Y.
Bancroft, Wilder Dwight....Ithaca, N. Y.
deBenneville, James S....Philadelphia, Pa.
Bogert, Marston Taylor....New York, N. Y.
Clark, William Mansfield....Baltimore, Md.
Conant, James Bryant....Cambridge, Mass.
Cottrell, Frederick Gardner....Washington, D. C.
Du Pont, Pierre Samuel....Wilmington, Del.
Eyring, Henry....Princeton, N. J.
Fieser, Louis Frederick....Belmont, Mass.
Giauque, William Francis....Berkeley, Calif.

Gomberg, Moses..............................Ann Arbor, Mich.
Harkins, William Draper............................Chicago, Ill.
Hawk, Philip Bovier.... ....Long Island City, N. Y.
Hopkins, B Smith..................................Urbana, Ill.
Hulett, George A..............................Princeton, N. J.
Irvine, James Colquhoun....................Fifeshire, Scotland
Keyes, Frederick George.......................Cambridge, Mass.
Kistiakowsky, George Bogdan...................Pittsburgh, Pa.
Kraus, Charles August.........................Providence, R. I.
Lamb, Arthur Becket..........................Cambridge, Mass.
Langmuir, Irving............................Schenectady, N. Y.
Lewis, Gilbert Newton..........................Berkeley, Calif.
MacInnes, Duncan Arthur.....................New York, N. Y.
Mees, Charles Edward Kenneth..............Rochester, N. Y.
Northrop, John Howard......................Princeton, N. J.
Patterson, Lamar Gray......................Perdido Beach, Ala.
Pauling, Linus Carl.............................Pasadena, Calif.
Smyth, Charles Phelps.........................Princeton, N. J.
Stanley, Wendell Meredith....................Princeton, N. J.
Svedberg, Theodor............................Upsala, Sweden
Taylor, Hugh Stott.............................Princeton, N. J.
Urey, Harold Clayton..............................Leonia, N. J.
Van Slyke, Donald Dexter....................New York, N. Y.
Whitney, Willis R............................Schenectady, N. Y.
Williams, Robert R...............................Summit, N. J.

Engineering

Bush, Vannevar.............................Washington, D. C.
Davis, Harvey N...............................Hoboken, N. J.
Derleth, Charles, Jr............................Berkeley, Calif.
Dunn, Gano.................................New York, N. Y.
Durand, William Frederick...........Stanford University, Calif.
Hoover, Herbert......................Stanford University, Calif.
Hunsaker, Jerome Clarke...........................Boston, Mass.
Jackson, Dugald Caleb......................Cambridge, Mass.
Jewett, Frank Baldwin........................New York, N. Y.
Kármán, Theodor von..........................Pasadena, Calif.
Kettering, Charles Franklin........................Dayton, Ohio
Pender, Harold..............................Philadelphia, Pa.
Timoshenko, Stephen P.........................Palo Alto, Calif.
Westergaard, Harald Malcolm.................Cambridge, Mass.
Wetherill, Samuel Price......................Philadelphia, Pa.
Yeatman, Pope................................New York, N. Y.

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Geology, Paleontology, Geography

Adams, Frank Dawson........................Montreal, Canada
Berkey, Charles Peter........................New York, N. Y.
Berry, Edward Wilber........................Baltimore, Md.
Blackwelder, Eliot...................Stanford University, Calif.
Bowen, Norman L................................Chicago, Ill.
Bowman, Isaiah..............................Baltimore, Md.
Bryant, William L..........................Providence, R. I.
Buddington, Arthur F.........................Princeton, N. J.
Byrd, Richard Evelyn..........................Boston, Mass.
Case, Ermine Cowles........................Ann Arbor, Mich.
Cross, Whitman...........................Chevy Chase, Md.
Daly, Reginald Aldworth....................Cambridge, Mass.
Day, Arthur L...............................Bethesda, Md.
Dunbar, Carl Owen.........................New Haven, Conn.
Gregory, Herbert Ernest......................Honolulu, Hawaii
Gregory, William King........................New York, N. Y.
Hobbs, William Herbert.....................Ann Arbor, Mich.
Johnson, Douglas............................New York, N. Y.
Lawson, Andrew Cowper.......................Berkeley, Calif.
Leith, Charles Kenneth.........................Madison, Wis.
Leverett, Frank............................Ann Arbor, Mich.
de Margerie, Emmanuel..........................Paris, France
Merriam, John C............................Pasadena, Calif.
Penck, Albrecht F. K..........................Berlin, Germany
Reid, Harry Fielding..........................Baltimore, Md.
Scott, William Berryman......................Princeton, N. J.
Simpson, George Gaylord.....................New York, N. Y.
Stefansson, Vilhjalmur.......................New York, N. Y.
Vaughan, Thomas Wayland..................Washington, D. C.
Warren, Charles Hyde......................New Haven, Conn.
Wilkins, Hubert.............................New York, N. Y.
Willis, Bailey......................Stanford University, Calif.
Wright, Frederick E.........................Washington, D. C.

Zoology, Anatomy

Andrews, Roy Chapman ....New York, N. Y.
Barbour, Thomas..............................Boston, Mass.
Bigelow, Henry Bryant.......................Cambridge, Mass.
Birge, Edward Asahel..........................Madison, Wis.

Bumpus, Hermon Carey........................Duxbury, Mass.
Calvert, Philip Powell..........................Cheyney, Pa.
Castle, William Ernest.......................Berkeley, Calif.
Chapman, Frank Michler....................New York, N. Y.
Cockerell, Theodore D. A.......................Boulder, Colo.
Conklin, Edwin Grant..........................Princeton, N. J.
Corner, George Washington....................Baltimore, Md.
Dahlgren, Ulric..................................Princeton, N. J.
Davenport, Charles Benedict.....Cold Spring Harbor, L. I., N. Y.
Detwiler, Samuel Randall......................New York, N. Y.
Dobzhansky, Theodosius.......................New York, N. Y.
Harrison, Ross G...........................New Haven, Conn.
Hisaw, Frederick Lee........................Cambridge, Mass.
Hjort, Johan......................................Oslo, Norway
Howard, Leland Ossian.......................Washington, D. C.
Jennings, Herbert S.........................Los Angeles, Calif.
Kofoid, Charles A..............................Berkeley, Calif.
Lillie, Frank Rattray............................Chicago, Ill.
McClung, Clarence E........................Swarthmore, Pa.
McClure, Charles F. W..........................Princeton, N. J.
McGregor, James Howard.....................New York, N. Y.
Mark, Edward Laurens.......................Cambridge, Mass.
Metz, Charles William.......................Philadelphia, Pa.
Miller, Gerrit Smith, Jr.....................Washington, D. C.
Moore, J. Percy..............................Philadelphia, Pa.
Morgan, Thomas Hunt.........................Pasadena, Calif.
Painter, Theophilus Shickel......................Austin, Texas
Parker, George Howard........................Cambridge, Mass.
Ruthven, Alexander G.........................Ann Arbor, Mich.
Schaeffer, J. Parsons..........................Philadelphia, Pa.
Schultz, Adolph H..............................Baltimore, Md.
Sturtevant, Alfred Henry.......................Pasadena, Calif.
Sumner, Francis Bertody........................La Jolla, Calif.
Taliaferro, William Hay..........................Chicago, Ill.
Thompson, D'Arcy Wentworth............St. Andrews, Scotland
Weed, Lewis Hill................................Baltimore, Md.
Wetmore, Alexander..........................Washington, D. C.
Wright, Sewall....................................Chicago, Ill.

Botany, Bacteriology

Allen, Charles Elmer............................Madison, Wis.
Arthur, Joseph Charles..........................Lafayette, Ind.
Bailey, Irving Widmer........................Cambridge, Mass.

Bailey, Liberty Hyde............................Ithaca, N. Y.
Bartlett, Harley Harris......................Ann Arbor, Mich.
Blakeslee, Albert Francis...................Northampton, Mass.
Campbell, Douglas Houghton..........Stanford University, Calif.
Cleland, Ralph Erskine......................Bloomington, Ind.
Crocker, William..............................Yonkers, N. Y.
Davis, Bradley Moore........................Ann Arbor, Mich.
Duggar, Benjamin Minge........................Madison, Wis.
Fernald, Merritt Lyndon.....................Cambridge, Mass.
Harper, Robert A...........................New York, N. Y.
Jones, Lewis Ralph............................Madison, Wis.
Kunkel, Louis Otto...........................Princeton, N. J.
Livingston, Burton E..........................Riderwood, Md.
MacDougal, Daniel Trembly.....................Carmel, Calif.
Macfarlane, John Muirhead.........................Paoli, Pa.
Merrill, Elmer Drew......................Jamaica Plain, Mass.
Moore, George Thomas..........................St. Louis, Mo.
Novy, Frederick G..........................Ann Arbor, Mich.
Prain, David....................Whyteleafe, Surrey, England
Robbins, William Jacob......................New York, N. Y.
Schramm, Jacob Richard.....................Philadelphia, Pa.
Setchell, William Albert......................Berkeley, Calif.
Shull, George Harrison.......................Princeton, N. J.
Sinnott, Edmund Ware......................New Haven, Conn.
Spoehr, Herman Augustus............Stanford University, Calif.
Stadler, Lewis John..........................Columbia, Mo.
Stakman, Elvin Charles........................St. Paul, Minn.
Trelease, William..............................Urbana, Ill.

Anthropology, Psychology

Angell, James Rowland......................New Haven, Conn.
Carmichael, Leonard...........................Medford, Mass.
Cattell, James McKeen.........................Garrison, N. Y.
Cole, Fay-Cooper...............................Chicago, Ill.
Hooton, Earnest A...........................Cambridge, Mass.
Hrdlička, Aleš...........................Washington, D. C.
Hunter, Walter Samuel.......................Providence, R. I.
Janet, Pierre...................................Paris, France
Keith, Arthur.....................Farnborough, Kent, England
Köhler, Wolfgang.............................Swarthmore, Pa.
Lashley, Karl Spencer.....................Orange Park, Fla.
MacCurdy, George Grant......................Old Lyme, Conn.
Thorndike, Edward L........................New York, N. Y.

Tozzer, Alfred Marston........................Cambridge, Mass.
Wissler, Clark..................................New York, N. Y.
Witmer, Lightner.................................Devon, Pa.
Woodworth, Robert Sessions..................New York, N. Y.
Yerkes, Robert Mearns.......................New Haven, Conn.

Physiology, Pathology

Adrian, Edgar Douglas.....................Cambridge, England
Benedict, Francis Gano......................Machiasport, Maine
Bronk, Detlev W..............................Philadelphia, Pa.
Brubaker, Albert P...........................Philadelphia, Pa.
Cannon, Walter Bradford.........................Boston, Mass.
Carlson, Anton Julius.............................Chicago, Ill.
Chittenden, Russell H.......................New Haven, Conn.
Dale, Henry Hallett..........................London, England
Doisy, Edward Adelbert....................Webster Groves, Mo.
Erlanger, Joseph................................St. Louis, Mo.
Flexner, Simon.................................New York, N. Y.
Forbes, Alexander...............................Boston, Mass.
Gasser, Herbert Spencer......................New York, N. Y.
Gies, William J..................................New York, N. Y.
Harvey, E. Newton.............................Princeton, N. J.
Hastings, A. Baird...............................Boston, Mass.
Henderson, Yandell..........................New Haven, Conn.
Hill, Archibald Vivian.......................London, England
Hopkins, Frederick Gowland................Cambridge, England
Howell, William Henry..........................Baltimore, Md.
Jacobs, Merkel Henry........................Philadelphia, Pa.
Krogh, August..........................Copenhagen, Denmark
Landsteiner, Karl..............................New York, N. Y.
Lillie, Ralph Stayner..............................Chicago, Ill.
Loeb, Leo...St. Louis, Mo.
Long, Esmond Ray............................Philadelphia, Pa.
Murlin, John Raymond.........................Rochester, N. Y.
Osterhout, Winthrop J. V....................New York, N. Y.
Richards, Alfred Newton......................Bryn Mawr, Pa.
Riddle, Oscar..................Cold Spring Harbor, L. I., N. Y.
Tyzzer, Ernest Edward.......................Wakefield, Mass.
Whipple, George Hoyt.........................Rochester, N. Y.

Medicine, Pharmacology, Surgery

Carrel, Alexis...................................New York, N. Y.
Castle, William Bosworth.........................Boston, Mass.

†Crile, George . . . . . Cleveland, Ohio
Darrach, William . . . . . New York, N. Y.
DuBois, Eugene Floyd . . . . . New York, N. Y.
Graham, Evarts Ambrose . . . . . St. Louis, Mo.
Heiser, Victor George . . . . . Bantam, Conn.
Joslin, Elliott Proctor . . . . . Boston, Mass.
MacNider, William de Berniere . . . . . Chapel Hill, N. C.
Minot, George Richards . . . . . Boston, Mass.
Norris, George William . . . . . Dimock, Pa.
Packard, Francis Randolph . . . . . Philadelphia, Pa.
Pepper, William . . . . . Philadelphia, Pa.
Ravenel, Mazÿck P. . . . . . Columbia, Mo.
Rivers, Thomas Milton . . . . . Forest Hills, L. I., N. Y.
Rous, Peyton . . . . . New York, N. Y.

CLASS III. SOCIAL SCIENCES

Economics, Statistics, Sociology

Commons, John Rogers . . . . . Ft. Lauderdale, Fla.
Day, Edmund Ezra . . . . . Ithaca, N. Y.
Dodds, Harold Willis . . . . . Princeton, N. J.
Fetter, Frank Albert . . . . . Princeton, N. J.
Fisher, Irving . . . . . New Haven, Conn.
Gay, Edwin Francis . . . . . San Marino, Calif.
Heckscher, Eli Filip . . . . . Stockholm, Sweden
Huebner, Solomon Stephen . . . . . Merion, Pa.
Johnson, Alvin Saunders . . . . . Nyack, N. Y.
Johnson, Emory R. . . . . . Philadelphia, Pa.
Kemmerer, Edwin Walter . . . . . Princeton, N. J.
MacIver, Robert Morrison . . . . . Palisades, N. Y.
Mitchell, Wesley Clair . . . . . New York, N. Y.
Moulton, Harold Glenn . . . . . Washington, D. C.
Ogburn, William Fielding . . . . . Chicago, Ill.
Patterson, Ernest Minor . . . . . Philadelphia, Pa.
Rappard, William E. . . . . . Geneva, Switzerland
Rist, Charles . . . . . Versailles, France
Sprague, Oliver M. W. . . . . . Boston, Mass.
Tawney, Richard Henry . . . . . Washington, D. C.
Viner, Jacob . . . . . Chicago, Ill.
Williams, John Henry . . . . . Cambridge, Mass.
Willits, Joseph Henry . . . . . New York, N. Y.

† Deceased.

Wilson, Edwin Bidwell..........................Boston, Mass.
Wolman, Leo..............................New York, N. Y.
Young, James Thomas ....Philadelphia, Pa.

Modern History

Adams, James Truslow........................Southport, Conn.
Andrews, Charles McLean....................New Haven, Conn.
Armstrong, Hamilton Fish....................New York, N. Y.
Beard, Charles Austin.....................New Milford, Conn.
Becker, Carl L................................Ithaca, N. Y.
Bolton, Herbert Eugene........................Berkeley, Calif.
Cheyney, Edward Potts..........................Media, Pa.
Farrand, Max............................Bar Harbor, Maine
Ford, Guy Stanton..........................Washington, D. C.
Fox, Dixon Ryan..........................Schenectady, N. Y.
Gooch, George Peabody......................London, England
Greene, Evarts B.....................Croton-on-Hudson, N. Y.
Hayes, Carlton Joseph Huntley.................New York, N. Y.
Lingelbach, William E........................Philadelphia, Pa.
McIlwain, Charles Howard ....Belmont, Mass.
Morison, Samuel Eliot..........................Canton, Mass.
Read, Conyers..............................Philadelphia, Pa.
Schlesinger, Arthur Meier....................Cambridge, Mass.
Schmitt, Bernadotte Everly......................Chicago, Ill.
Schuyler, Robert Livingston...................New York, N. Y.
Seymour, Charles...........................New Haven, Conn.
Shotwell, James Thomson.....................New York, N. Y.
Sioussat, St. George Leakin..................Washington, D. C.
Wertenbaker, Thomas Jefferson................Princeton, N. J.

Jurisprudence

Chamberlain, Joseph Perkins...................New York, N. Y.
Corwin, Edward Samuel........................Princeton, N. J.
Davis, John William..........................New York, N. Y.
Dickinson, John.............................Philadelphia, Pa.
Duane, Morris...............................Philadelphia, Pa.
Frankfurter, Felix..........................Washington, D. C.
Goodrich, Herbert Funk......................Philadelphia, Pa.
Hudson, Manley Ottmer.......................Cambridge, Mass.
Hughes, Charles Evans......................Washington, D. C.
Jessup, Philip C............................New York, N. Y.
Kelley, Nicholas............................New York, N. Y.

Landis, James McCauley........................Cambridge, Mass.
Miller, Hunter..........................Victoria, B. C., Canada
Moore, John Bassett..........................New York, N. Y.
Morris, Roland S.............................Philadelphia, Pa.
Pepper, George Wharton.....................Philadelphia, Pa.
Pound, Roscoe...............................Watertown, Mass.
Roberts, Owen J...........................Washington, D. C.
Rogers, Lindsay..............................New York, N. Y.
Scott, James Brown...........................Annapolis, Md.
Scott, John Morin............................Philadelphia, Pa.
Stone, Harlan Fiske.........................Washington, D. C.
Warren, Charles............................Washington, D. C.
Wilson, George Grafton.......................Cambridge, Mass.

Administration, Government

Beneš, Eduard...............................London, England
Butler, Nicholas Murray.......................New York, N. Y.
Crane, Robert Treat...........................New York, N. Y.
Delano, Frederic Adrian.....................Washington, D. C.
Fosdick, Raymond Blaine......................New York, N. Y.
Gates, Thomas Sovereign.....................Philadelphia, Pa.
Gifford, Walter Sherman.......................New York, N. Y.
Keith, Arthur Berriedale...................Edinburgh, Scotland
†Lowell, Abbott Lawrence........................Boston, Mass.
McClelland, George William..................Philadelphia, Pa.
Merriam, Charles Edward.........................Chicago, Ill.
Putnam, Herbert............................Washington, D. C.
Rockefeller, John D., Jr.......................New York, N. Y.
Rowe, Leo S................................Washington, D. C.
Young, Owen D...............................New York, N. Y.
van Zeeland, Paul............................New York, N. Y.

Affairs

Burgess, Warren Randolph.....................New York, N. Y.
Douglas, Lewis Williams......................New York, N. Y.
Fels, Samuel S...............................Philadelphia, Pa.
Hayward, Nathan.............................Philadelphia, Pa.
Hopkinson, Edward, Jr.......................Philadelphia, Pa.
Jenks, John Story............................Philadelphia, Pa.
Johnson, Eldridge Reeves.......................Camden, N. J.

† Deceased.

Lamont, Thomas William........................New York, N. Y.
Leeds, Morris Evans..........................Philadelphia, Pa.
Mason, William Smith............................Evanston, Ill.
Morgan, Marshall S..............................Malvern, Pa.
Morris, Lawrence J..........................Philadelphia, Pa.
Norris, George Washington...................Philadelphia, Pa.
Rhoads, Charles James.........................Bryn Mawr, Pa.
Rosengarten, Adolph G..........................St. Davids, Pa.
Scattergood, J. Henry..........................Villa Nova, Pa.

CLASS IV. HUMANITIES

Philosophy, Education

Dewey, John.................................New York, N. Y.
Graves, Frank Pierrepont.........................Albany, N. Y.
Haney, John Louis...........................Philadelphia, Pa.
Hu Shih.....................................New York, N. Y.
Keppel, Frederick Paul........................New York, N. Y.
Lewis, Clarence Irving.......................Lexington, Mass.
Lovejoy, Arthur Oncken.........................Baltimore, Md.
Perry, Ralph Barton.........................Cambridge, Mass.
Singer, Edgar Arthur, Jr........... ..... Philadelphia, Pa.

Ancient, Medieval and Cultural History

Bell, Harold Idris...........................London, England
Chinard, Gilbert.............................Princeton, N. J.
Cumont, Franz Valery Marie.......................Rome, Italy
Ferguson, William Scott.....................Cambridge, Mass.
Leland, Waldo G.............................Washington, D. C.
Lowie, Robert H...............................Berkeley, Calif.
Nock, Arthur Darby..........................Cambridge, Mass.
Rostovtzeff, Michael I........................New Haven, Conn.
Sarton, George..............................Cambridge, Mass.
Thorndike, Lynn.............................New York, N. Y.

Archaeology, History of Art and Architecture

Albright, William F............................Baltimore, Md.
Blegen, Carl William..........................Cincinnati, Ohio
Carpenter, Rhys..............................Downingtown, Pa.
Chase, George Henry.........................Cambridge, Mass.
Cret, Paul Philippe.........................Philadelphia, Pa.

Dinsmoor, William Bell........................New York, N. Y.
Holland, Leicester Bodine.....................Philadelphia, Pa.
Jayne, Horace Howard Furness................New York, N. Y.
Kenyon, Frederic George.............Godstone, Surrey, England
Kidder, Alfred Vincent........................Cambridge, Mass.
Kroeber, Alfred Louis.........................Berkeley, Calif.
Meritt, Benjamin Dean........................Princeton, N. J.
Morley, Sylvanus Griswold..............Merida, Yucatan, Mexico
Nilsson, Martin P...............................Lund, Sweden
Richter, Gisela M. A..........................New York, N. Y.
Robinson, David Moore........................Baltimore, Md.
Shear, Theodore Leslie........................Princeton, N. J.
Stein, Aurel...............................Srinagar, Kashmir
Winlock, Herbert Eustis......................New York, N. Y.

Languages and Literary History

Alonso, Amado........................Buenos Aires, Argentina
Armstrong, Edward Cooke.....................Princeton, N. J.
Beeson, Charles Henry............................Chicago, Ill.
Bloomfield, Leonard.........................New Haven, Conn.
Bonner, Campbell............................Ann Arbor, Mich.
Buck, Carl Darling...............................Chicago, Ill.
Capps, Edward...............................Princeton, N. J.
Craigie, Sir William A.........................Oxford, England
Edgerton, Franklin..........................New Haven, Conn.
Gulick, Charles Burton.......................Cambridge, Mass.
Hendrickson, George Lincoln.................New Haven, Conn.
Lancaster, Henry Carrington...................Baltimore, Md.
McDaniel, Walton Brooks...................Coconut Grove, Fla.
Matthews, Albert................................Boston, Mass.
Méndez-Pereira, Octavio................Panama City, Panama
Montgomery, James Alan.....................Philadelphia, Pa.
Nitze, William Albert.......................Los Angeles, Calif.
Pidal, Ramón Menéndez..........................Madrid, Spain
Prince, John Dyneley.........................New York, N. Y.
Rand, Edward Kennard........................Cambridge, Mass.
†Rolfe, John Carew...........................Alexandria, Va.
Sanders, Henry A............................Ann Arbor, Mich.
Speiser, Ephraim Avigdor.....................Elkins Park, Pa.
Sturtevant, Edgar Howard..................New Haven, Conn.
Tatlock, John S. P............................Berkeley, Calif.
Toynbee, Arnold Joseph.....................London, England

† Deceased.

Letters and Fine Arts

Adams, Joseph Quincy........................Washington, D. C.
Aydelotte, Frank ....Princeton, N. J.
Brooke, C. F. Tucker.........................New Haven, Conn.
Brooks, Van Wyck.............................Westport, Conn.
Cather, Willa..................................New York, N. Y.
Cross, Wilbur L...............................New Haven, Conn.
Damrosch, Walter Johannes....................New York, N. Y.
Frost, Robert...............................South Shaftsbury, Vt.
Jones, Howard Mumford......................Cambridge, Mass.
Lowes, John Livingston.......................Cambridge, Mass.
Lydenberg, Harry Miller....................Mexico City, Mexico
Mann, Thomas.................................Palisades, Calif.
Mather, Frank Jewett, Jr..............Washington Crossing, Pa.
Morey, Charles Rufus.........................Princeton, N. J.
Morris, Harrison Smith.......................Philadelphia, Pa.
Mumford, Lewis................................Amenia, N. Y.
Nicolson, Marjorie Hope.......................New York, N. Y.
O'Neill, Eugene Gladstone......................Danville, Calif.
Phelps, William Lyon.........................New Haven, Conn.
Quinn, Arthur Hobson.......................Bala-Cynwyd, Pa.
Repplier, Agnes...............................Philadelphia, Pa.
Rosenbach, A. S. W...........................Philadelphia, Pa.
Schelling, Felix E............................Mt. Vernon, N. Y.
Taylor, Deems.................................Stamford, Conn.
Van Doren, Carl...............................New York, N. Y.

GEOGRAPHICAL OR PROFESSIONAL LOCATIONS OF MEMBERS

Residents of the United States

Alabama

PERDIDO BEACH
Patterson, Lamar Gray

Arizona

FLAGSTAFF
Lampland, Carl O.
Slipher, Vesto Melvin

TUCSON
Douglass, Andrew Ellicott

California

BERKELEY
Aitken, Robert Grant
Bolton, Herbert Eugene
Castle, William Ernest
Derleth, Charles, Jr.
Evans, Griffith Conrad
Giauque, William Francis
Kofoid, Charles A
Kroeber, Alfred Louis
Lawrence, Ernest Orlando
Lawson, Andrew Cowper
Leuschner, Armin Otto
Lewis, Gilbert Newton
Lowie, Robert H.
Setchell, William Albert
Tatlock, J. S. P.

CARMEL
MacDougal, Daniel Trembly

DANVILLE
O'Neill, Eugene Gladstone

LA JOLLA
Sumner, Francis Bertody

LOS ANGELES
Jennings, Herbert S.

MT. HAMILTON
Wright, William Hammond

PALISADES
Mann, Thomas

PALO ALTO
Tucker, Richard Hawley

PASADENA
Adams, Walter Sydney
Anderson, Carl David
Bateman, Harry
Bell, Eric Temple
Bowen, Ira Sprague
Gay, Edwin Francis
Hubble, Edwin P.
Kármán, Theodor von
Merriam, John C.
Merrill, Paul Willard
Millikan, Robert Andrews
Morgan, Thomas Hunt
Pauling, Linus Carl
Seares, Frederick Hanley
Sturtevant, Alfred Henry
Tolman, Richard Chace

STANFORD UNIVERSITY
Blackwelder, Eliot
Campbell, Douglas Houghton

Durand, William Frederick
Hoover, Herbert
Spoehr, Herman Augustus
Timoshenko, Stephen P.
Webster, David Locke
Willis, Bailey

VALLEJO

See, Thomas Jefferson Jackson

Colorado

BOULDER

Cockerell, Theodore D. A.

Connecticut

BANTAM

Heiser, Victor George

NEW HAVEN

Andrews, Charles McLean
Angell, James Rowland
Bloomfield, Leonard
Brooke, C. F. Tucker
Chittenden, Russell H.
Cross, Wilbur L.
Dunbar, Carl O.
Edgerton, Franklin
Fisher, Irving
Harrison, Ross G.
Henderson, Yandell
Hendrickson, George Lincoln
Phelps, William Lyon
Rostovtzeff, Michael I.
Schlesinger, Frank
Seymour, Charles
Sinnott, Edmund Ware
Sturtevant, Edgar Howard
Warren, Charles Hyde
Yerkes, Robert Mearns
Zeleny, John

NEW MILFORD

Beard, Charles Austin

OLD LYME

MacCurdy, George Grant

SOUTHPORT

Adams, James Truslow

STAMFORD

Taylor, Deems

WESTPORT

Brooks, Van Wyck

Delaware

WILMINGTON

Du Pont, Pierre Samuel

District of Columbia

WASHINGTON

Abbot, Charles Greeley
Adams, Joseph Quincy
Briggs, Lyman J.
Bush, Vannevar
Cottrell, Frederick Gardner
Cross, Whitman
Day, Arthur L.
Delano, Frederic Adrian
Ford, Guy Stanton
Frankfurter, Felix
Howard, Leland Ossian
Hrdlička, Aleš
Hu Shih
Hughes, Charles Evans
Humphreys, William Jackson
Leland, Waldo G.
Miller, Gerrit Smith, Jr.
Moulton, Forest Ray
Moulton, Harold Glenn
Putnam, Herbert
Roberts, Owen J.
Rowe, Leo S.
Sioussat, St. George Leakin
Stone, Harlan Fiske
Tawney, Richard H.
Vaughan, Thomas Wayland

Warren, Charles
Wetmore, Alexander
Wright, Frederick E.

Florida

COCONUT GROVE

McDaniel, Walton Brooks

FT. LAUDERDALE

Commons, John Rogers

Hawaii

HONOLULU

Gregory, Herbert Ernest

Illinois

CHICAGO

Beeson, Charles Henry
Bliss, Gilbert Ames
Bowen, Norman L.
Buck, Carl Darling
Carlson, Anton Julius
Cole, Fay-Cooper
Compton, Arthur Holly
Dempster, Arthur Jeffrey
Franck, James
Harkins, William Draper
Lillie, Frank Rattray
Lillie, Ralph Stayner
Merriam, Charles Edward
Mulliken, Robert Sanderson
Nitze, William Albert
Ogburn, William Fielding
Schmitt, Bernadotte E.
Taliaferro, William Hay
Viner, Jacob
Wright, Sewall

EVANSTON

Crew, Henry
Mason, William Smith

URBANA

Adams, Roger
Coble, Arthur Byron
Hopkins, B Smith
Trelease, William

Indiana

BLOOMINGTON

Cleland, Ralph Erskine

Maine

BAR HARBOR

Farrand, Max

MACHIASPORT

Benedict, Francis Gano

Maryland

ANNAPOLIS

Scott, James Brown

BALTIMORE

Albright, William F.
Andrews, Donald Hatch
Berry, Edward Wilber
Bowman, Isaiah
Clark, William Mansfield
Corner, George Washington
Howell, William Henry
Lancaster, Henry Carrington
Livingston, Burton E.
Lovejoy, Arthur Oncken
Murnaghan, Francis D.
Reid, Harry Fielding
Robinson, David Moore
Schultz, Adolph H.
Weed, Lewis H.

Massachusetts

BELMONT

DuBridge, Lee A.

Boston

Byrd, Richard Evelyn
Cannon, Walter Bradford
Castle, William Bosworth
Forbes, Alexander
Hastings, A. Baird
Joslin, Elliott Proctor
Matthews, Albert
Merrill, Elmer Drew
Minot, George Richards
Sprague, Oliver M. W.
Tyzzer, Ernest Edward
Wilson, Edwin Bidwell

Cambridge

Bailey, Irving Widmer
Barbour, Thomas
Bigelow, Henry Bryant
Birkhoff, George David
Bridgman, Percy Williams
Chase, George Henry
Compton, Karl Taylor
Conant, James Bryant
Daly, Reginald Aldworth
Ferguson, William Scott
Fernald, Merritt Lyndon
Fieser, Louis Frederick
Gaposchkin, Cecilia Payne
Gulick, Charles Burton
Hisaw, Frederick Lee
Hooton, Earnest A.
Hudson, Manley Ottmer
Hunsaker, Jerome Clarke
Huntington, Edward V.
Jackson, Dugald Caleb
Jones, Howard Mumford
Keyes, Frederick George
Kidder, Alfred Vincent
Kistiakowsky, George B.
Lamb, Arthur Becket
Landis, James McC.
Lashley, Karl Spencer
†Lowell, Abbott Lawrence
Lowes, John Livingston
Lyman, Theodore
McIlwain, Charles Howard
Mark, Edward Laurens
Morison, Samuel Eliot
Nock, Arthur Darby
Osgood, William Fogg
Parker, George Howard
Perry, Ralph Barton
Pound, Roscoe
Rabi, Isidor Isaac
Rand, Edward Kennard
Sarton, George
Schlesinger, Arthur Meier
Shapley, Harlow
Slater, John Clarke
Tozzer, Alfred Marston
Van Vleck, John Hasbrouck
Westergaard, Harald M.
Williams, John H.
Wilson, George Grafton

Duxbury

Bumpus, Hermon Carey

Lexington

Lewis, Clarence I.

Medford

Carmichael, Leonard

Northampton

Blakeslee, Albert F.

Michigan

Ann Arbor

Bartlett, Harley Harris
Bonner, Campbell
Case, Ermine Cowles
Davis, Bradley Moore
Gomberg, Moses
Hobbs, William Herbert

† Deceased.

Leverett, Frank
Novy, Frederick G.
Ruthven, Alexander G.
Sanders, Henry A.

PONTIAC
McMath, Robert R.

Minnesota

MINNEAPOLIS
Tate, John Torrence

ST. PAUL
Stakman, Elvin Charles

Missouri

COLUMBIA
Ravenel, Mazÿck
Stadler, Lewis John

ST. LOUIS
Erlanger, Joseph
Graham, Evarts Ambrose
Loeb, Leo
Moore, George Thomas

WEBSTER GROVES
Doisy, Edward A.

New Hampshire

HOPKINTON
Goodspeed, Arthur W.

New Jersey

CAMDEN
Johnson, Eldridge Reeves

HOBOKEN
Davis, Harvey Nathaniel

PRINCETON
Adams, Edwin Plimpton
Alexander, James W.
Armstrong, Edward Cooke
Aydelotte, Frank
Buddington, Arthur F.
Capps, Edward
Chinard, Gilbert
Conklin, Edwin Grant
Corwin, Edward Samuel
Dahlgren, Ulric
Dodds, Harold Willis
Einstein, Albert
Eisenhart, Luther Pfahler
Eyring, Henry
Fetter, Frank Albert
Harvey, E. Newton
Hulett, George A.
Kemmerer, Edwin Walter
Kunkel, Louis O.
Lefschetz, Solomon
McClure, Charles F. W.
Magie, William Francis
Mather, Frank Jewett, Jr.
Meritt, Benjamin Dean
Morey, Charles Rufus
Morse, Marston
von Neumann, John
Northrop, John Howard
Robertson, Howard Percy
Russell, Henry Norris
Scott, William Berryman
Shear, Theodore Leslie
Shull, George Harrison
Smyth, Charles Phelps
Stanley, Wendell Meredith
Taylor, Hugh Stott
Veblen, Oswald
Wertenbaker, Thomas J.
Weyl, Hermann

SUMMIT
Williams, Robert R.

New York

ALBANY
Graves, Frank Pierrepont

AMENIA
Mumford, Lewis

COLD SPRING HARBOR
Davenport, Charles Benedict
Riddle, Oscar

FOREST HILLS
Rivers, Thomas M.

ITHACA
Bailey, Liberty Hyde
Bancroft, Wilder Dwight
Becker, Carl L.
Day, Edmund Ezra
Debye, Peter

NEW YORK
Andrews, Roy Chapman
Armstrong, Hamilton Fish
Baekeland, Leo H.
Berkey, Charles Peter
Bogert, Marston Taylor
Buckley, Oliver E.
Burgess, Warren R.
Butler, Nicholas Murray
Carrel, Alexis
Cather, Willa
Cattell, James McKeen
Chamberlain, Joseph Perkins
Chapman, Frank Michler
Crane, Robert Treat
Crocker, William
Damrosch, Walter Johannes
Darrach, William
Darrow, Karl Kelchner
Davis, John William
Davisson, Clinton J.
Detwiler, Samuel Randall
Dewey, John
Dinsmoor, William Bell
Dobzhansky, Theodosius
Douglas, Lewis W.
DuBois, Eugene Floyd
Dunn, Gano
Fermi, Enrico
Flexner, Simon
Fosdick, Raymond Blaine
Gasser, Herbert Spencer
Gies, William J.
Gifford, Walter Sherman
Greene, Evarts B.
Gregory, William King
Harper, Robert A.
Hawk, Philip Bovier
Hayes, Carlton J. H.
Ives, Herbert E.
Jayne, Horace H. F.
Jessup, Philip C.
Jewett, Frank Baldwin
Johnson, Douglas
Kelley, Nicholas
Keppel, Frederick Paul
Lamont, Thomas William
Landsteiner, Karl
McGregor, James Howard
MacInnes, Duncan A.
Mitchell, Wesley Clair
Moore, John Bassett
Nicolson, Marjorie Hope
Osterhout, Winthrop J. V.
Prince, John Dyneley
Richter, Gisela M. A.
Robbins, William Jacob
Rockefeller, John D., Jr.
Rogers, Lindsay
Rous, Peyton
Schelling, Felix E.
Schuyler, Robert L.
Shotwell, James Thomson
Simpson, George Gaylord
Stefansson, Vilhjalmur
Thorndike, Edward L.
Thorndike, Lynn
Urey, Harold Clayton
Van Doren, Carl
Van Slyke, Donald Dexter
Wilkins, Hubert
Willits, Joseph Henry

Winlock, Herbert Eustis
Wissler, Clark
Wolman, Leo
Woodworth, Robert Sessions
Yeatman, Pope
Young, Owen D.
van Zeeland, Paul

NYACK

Johnson, Alvin S.

PALISADES

MacIver, Robert M.

ROCHESTER

Mees, C. E. Kenneth
Murlin, John Raymond
Whipple, George Hoyt

SCHENECTADY

Coolidge, William David
Fox, Dixon Ryan
Langmuir, Irving
Whitney, Willis R.

TUXEDO PARK

Loomis, Alfred Lee

North Carolina

CHAPEL HILL

MacNider, William de B.

Ohio

CINCINNATI

Blegen, Carl William

CLEVELAND

†Crile, George

DAYTON

Kettering, Charles Franklin

Pennsylvania

BRYN MAWR

Carpenter, Rhys

PHILADELPHIA

deBenneville, James S.
Bronk, Detlev W.
Brubaker, Albert P.
Calvert, Philip Powell
Cheyney, Edward Potts
Cret, Paul Philippe
Dickinson, John
Duane, Morris
Fels, Samuel S.
Gates, Thomas Sovereign
Goodrich, Herbert Funk
Haney, John Louis
Hayward, Nathan
Holland, Leicester Bodine
Hopkinson, Edward, Jr.
Huebner, Solomon Stephen
Jacobs, Merkel Henry
Jenks, John Story
Johnson, Emory R.
Kline, John Robert
Leeds, Morris Evans
Lingelbach, William E.
Long, Esmond Ray
McClelland, George William
Macfarlane, John Muirhead
Metz, Charles William
Mitchell, Howard Hawks
Montgomery, James Alan
Moore, J. Percy
Morgan, Marshall S.
Morris, Harrison Smith
Morris, Lawrence J.
Morris, Roland S.
Norris, George William
Olivier, Charles P.
Packard, Francis Randolph
Patterson, Ernest Minor
Pender, Harold
Pepper, George Wharton
Pepper, William
Quinn, Arthur Hobson

† Deceased.

Read, Conyers
Repplier, Agnes
Rhoads, Charles James
Richards, Alfred Newton
Richards, Horace Clark
Rosenbach, A. S. W.
Rosengarten, Adolph G.
Scattergood, J. Henry
Schaeffer, J. Parsons
Schramm, Jacob R.
Scott, John Morin
Singer, Edgar Arthur, Jr.
Speiser, Ephraim Avigdor
Wetherill, Samuel Price
Witmer, Lightner
Young, James Thomas

PITTSBURGH

Foote, Paul Darwin

SWARTHMORE

Dresden, Arnold
Köhler, Wolfgang
McClung, Clarence E.
Miller, John Anthony
Swann, W. F. G.

Rhode Island

PROVIDENCE

Bryant, William L.
Hunter, Walter Samuel
Kraus, Charles August

Texas

AUSTIN

Painter, Theophilus Shickel

HOUSTON

Lovett, Edgar Odell
Wilson, Harold Albert

Vermont

S. SHAFTSBURY

Frost, Robert

Virginia

ALEXANDRIA

Rolfe, John C.

UNIVERSITY

Beams, Jesse Wakefield
Mitchell, Samuel Alfred

Wisconsin

MADISON

Allen, Charles Elmer
Birge, Edward Asahel
Duggar, Benjamin Minge
Jones, Lewis Ralph
Leith, Charles Kenneth
Stebbins, Joel

WILLIAMS BAY

Struve, Otto

FOREIGN RESIDENTS

South America

ARGENTINA

Amado, Alonso

Canada

MONTREAL

Adams, Frank Dawson

VICTORIA

Miller, Hunter

Mexico

MERIDA, YUCATAN

Morley, Sylvanus Griswold

MEXICO CITY
Lydenberg, Harry Miller

Denmark

COPENHAGEN
Bohr, Niels Henrik David
Krogh, August

England

CAMBRIDGE
Adrian, Edgar Douglas
Dirac, Paul Adrien Maurice
Eddington, Arthur Stanley
Hardy, Godfrey Harold
Hopkins, Frederick Gowland

DOWNE, KENT
Keith, Arthur

GREENWICH PARK
Jones, Harold S.

HARPENDEN, HERTFORDSHIRE
Fisher, Ronald Aylmer

LONDON
Bell, Harold Idris
Beneš, Eduard
Dale, Henry Hallett
Gooch, George Peabody
Hill. Archibald Vivian
Kenyon, Frederic George
Prain, David
Richardson, Owen Willans
Toynbee, Arnold Joseph

OXFORD
Craigie, William A.

France

PARIS
de Broglie, Louis Victor
Janet, Pierre
de Margerie, Emmanuel
Rist, Charles

Germany

BERLIN
Penck, Albrecht F. K.
Planck, Max

GÖTTINGEN
[1] Hilbert, David

LEIPZIG
Heisenberg, Werner

India

KASHMIR
Stein, Aurel

Netherlands

LEIDEN
Hertzsprung, Ejnar
Kramers, Hendrik A.

Norway

OSLO
Hjort, Johan

Panama

PANAMA CITY
Méndez-Pereira, Octavio

Scotland

EDINBURGH
Keith, Arthur Berriedale

ST. ANDREWS
Irvine, James Colquhoun
Thompson, D'Arcy W.

Spain

MADRID
Pidal, Ramón Menéndez

[1] Deceased.

Sweden

LUND

Nilsson, Martin P.

STOCKHOLM

Heckscher, Eli Filip

UPSALA

Svedberg, Theodor

Switzerland

GENEVA

Rappard, William E.

U. S. S. R.

MOSCOW

Vinogradov, Ivan M.

MEMBERS ELECTED APRIL 24, 1942

CLASS I. MATHEMATICAL AND PHYSICAL SCIENCES

Resident

Oliver Ellsworth Buckley........................New York, N. Y.
Lee Alvin DuBridge.................. . .....Rochester, N. Y.
Duncan Arthur MacInnes........................New York, N. Y.
Robert Raynolds McMath........................Pontiac, Mich.
Francis Dominic Murnaghan....................Baltimore, Md.
Harald Malcolm Westergaard..................Cambridge, Mass.
Robert R. Williams............................Summit, N. J.

Foreign

Harold Spencer Jones......................Greenwich, England
Hendrik Anthony Kramers............ .....Leiden, Netherlands
Ivan Matveitch Vinogradov..................Moscow, U. S. S. R.

CLASS II. GEOLOGICAL AND BIOLOGICAL SCIENCES

Resident

Leonard Carmichael.............................Medford, Mass.
Theodosius Dobzhansky........................New York, N. Y.
Edward Adelbert Doisy..........................St. Louis, Mo.
Carl Owen Dunbar..........................New Haven, Conn.
Louis Otto Kunkel...........................Princeton, N. J.
Thomas Milton Rivers........................New York, N. Y.
Lewis Hill Weed.............................Baltimore, Md.

CLASS III. SOCIAL SCIENCES

Resident

Warren Randolph Burgess....................New York, N. Y.
James McCauley Landis......................Cambridge, Mass.
Robert Morrison MacIver.......................Palisades, N. Y.
Bernadotte Everly Schmitt.........................Chicago, Ill.
Robert Livingston Schuyler....................New York, N. Y.
Jacob Viner..Chicago, Ill.
John Henry Williams........................Cambridge, Mass.

Foreign

Octavio Méndez-Pereira..................Panama City, Panama
Richard Henry Tawney......................London, England
Paul van Zeeland..........................Brussels, Belgium

CLASS IV. HUMANITIES

Resident

Leonard Bloomfield..........................New Haven, Conn.
Clarence Irving Lewis........................Lexington, Mass.
Robert Harry Lowie..........................Berkeley, Calif.
Thomas Mann.........................Pacific Palisades, Calif.
Gisela Marie Augusta Richter..................New York, N. Y.
Carl Van Doren..............................New York, N. Y.

Foreign

Amado Alonso........................Buenos Aires, Argentina
Sir William A. Craigie........................Oxford, England

COUNCIL NOMINEES

Lewis Williams Douglas.......................New York, N. Y.
Alvin Saunders Johnson.........................Nyack, N. Y.
Nicholas Kelley..............................New York, N. Y.

MEMBERS DECEASED DURING 1942

	Date of election
Stewart Paton, January 7, aet. 76	1914
Heber D. Curtis, January 8, aet. 69	1920
Lawrence J. Henderson, February 10, aet. 64	1921
Robert Henderson, February 16, aet. 71	1927
Herbert Fox, February 26, aet. 61	1932
Sir William Henry Bragg, March 12, aet. 79	1940
Francis I. du Pont, March 16, aet. 68	1930
Joseph C. Arthur, April 30, aet. 92	1919
George Washington Norris, May 13, aet. 78	1937
Sir Joseph Larmor, May 19, aet. 84	1913
George Andrew Reisner, June 6, aet. 74	1940
George A. Barton, June 28, aet. 83	1911
Jesse S. Reeves, July 7, aet. 71	1934
Sir Flinders Petrie, July 28, aet. 89	1905
Jacob Gould Schurman, August 12, aet. 88	1908
Charles Schuchert, November 20, aet. 84	1913
Franz Boas, December 21, aet. 84	1903

TABLE OF TOTALS

	Resident Members	Foreign Members
December 31, 1941	451	45
Elected during 1942	30	8
Deceased during 1942	14	3
December 31, 1942	467	50

XI

OBITUARIES

JOSEPH CHARLES ARTHUR

(1850–1942)

Joseph Charles Arthur, Professor Emeritus of Botany in Purdue University, was born at Lowville, N. Y., on January 11, 1850. When six years of age his parents moved west and settled on a farm near Charles City, Iowa. He attended the public schools and, surrounded by the largely undisturbed prairies, soon developed an interest in botany which remained throughout his life. When Iowa State College was opened he enrolled and graduated in the first class in 1872. In 1877 he received the M.S. degree from the same institution and in 1886 earned the degree of D.Sc. from Cornell University. He held the position of Instructor in Botany at Iowa State College (1876–1878), the University of Wisconsin (1879–1881) and the University of Minnesota (1882). From 1884–1887 he was Botanist in the New York Agricultural Experiment Station at Geneva. In 1887 Arthur came to Purdue University as Professor of Botany and in 1888 became Botanist in the Purdue University Agricultural Experiment Station, a position which he held until his retirement in 1915.

As might be expected, Arthur's early botanical studies and writings dealt with the native flora of Iowa, with his first publication appearing in 1872. His studies soon became diversified, however, and one finds papers dealing with histology, physiology, and mycology. He was one of the first to demonstrate that bacteria could cause diseases of plants and his studies of pear blight are classics in the field, the work being done while he was Botanist in the New York Experiment Station. The *Handbook of Plant Dissection* by Arthur, Barnes, and Coulter was long known as the ABC book of Botany. He also published a booklet entitled *Laboratory Exercises in Vegetable Physiology* and, with D. T. MacDougal, *Living Plants and their Properties.*

After coming to Purdue University, Arthur gave much attention to plant physiology and designed original apparatus to advance his studies. Some of this apparatus was exhibited in 1893 at the Columbian Exposition and again as late as the Century of Progress. As Station Botanist at Purdue Arthur carried out general work in the field of plant pathology. Probably his outstanding contribution to this field of knowledge was his work with formaldehyde in the control of potato scab.

Although Arthur's interest in botany was general he nevertheless early developed that special interest in the plant rusts (Uredinales) which was to gain for him international recognition as an authority. Because of this early and intense interest he was chosen to prepare that portion of the *North American Flora* which dealt with the Uredinales. This was published as parts 2–13 of volume 7. Arthur also proposed a new classification, which was followed in the *North American Flora,* based upon life cycles. While this classification was never generally accepted and did produce an undesired multiplication of names it nonetheless proved to be of positive value in that it focused attention upon the life cycles and their importance in the interrelationships of the rust fungi. The results of investigations concerning life cycles and alternate hosts of heteroecious rusts were reported in a long series of papers entitled "Cultures of Uredineae in—." Of even greater magnitude are his series of papers describing new species and genera and reporting the rusts of various countries of North and South America. One of the more voluminous of the latter papers, "The Grass Rusts of South America"; based on the Holway Collections, was published in Volume 64 of the PROCEEDINGS of the American Philosophical Society. As a result of these studies Arthur was recognized as the leading American authority on the rust fungi. The herbarium, now the property of Purdue University and known as the Arthur Herbarium, which he developed in connection with his studies is composed of some 60,000 specimens and is especially richly provided with types, culture material, notes, drawings, and photographs.

Arthur believed that the accumulation of information, however satisfying to the personal curiosity and urge to know, did little to advance science unless the discovered facts were presented in published form. He also believed that to accomplish the maximum one must not too often leave the main path of investigation, however inviting the by-paths. That he persistently practiced his be-

liefs is clearly on record since his first paper dealing with the rusts appeared in 1883 and the one hundred and forty-ninth and last in 1936. In an effort appropriately to summarize the information accumulated in his laboratory he and six associates published in 1929, *The Plant Rusts,* a general reference book treating of all phases of Uredinology. As a companion work Arthur published the *Manual of the Rusts in United States and Canada* in 1934.

Arthur did not view his retirement in 1915 as an opportunity to rest after an already active and fruitful life. Rather, he welcomed it as a release from official duties in the Experiment Station and as a time when his chosen work could be conducted without interruption. Not all men accomplish in a lifetime the amount of valuable work that he completed in the twenty years following retirement. If proof is needed that his interest and energy did not suffer with advancing age one needs only to point out that *The Plant Rusts* was published when he was eighty years of age and *The Manual of Rusts* when he was eighty-five.

While Arthur was not long in the teaching profession he had, nevertheless, a profound influence in the field of botanical research. The many associates who were privileged to work with him have, in the main, achieved more than usual eminence as botanists. Moreover, his influence in botanical organizations was far-reaching for he was a member of many societies and a charter member of the Botanical Society of America, the Indiana Academy of Science, the American Phytopathological Society, the Mycological Society of America, the Société Mycologique de France, the Association International des Botanistes, and the American Association of University Professors. He served as President of the first three of the above societies, as Secretary of section F, Vice President of section G and Assistant General Secretary of the American Association for the Advancement of Science, as Secretary of the Madison Botanical Congress and as a delegate to the International Botanical Congresses in Vienna, Brussels, and Cambridge. Arthur's services to the world of science were well known and widely appreciated and he received many honors. He was a Fellow of the American Academy of Arts and Sciences, of the American Association for the Advancement of Science, of the Indiana Academy of Science and of the Iowa Academy of Science. Honorary degrees were conferred upon him by Iowa State College (Sc.D., 1920), Purdue University (Sc.D., 1931) and the State University of Iowa (LL.D., 1916). In

1919 he was elected to membership in the American Philosophical Society.

Joseph Charles Arthur died April 30, 1942, at Brook, Indiana. In 1901 he had married Emily Stiles Potter of Lafayette, Indiana, who preceded him in death.

George B. Cummins

GEORGE AARON BARTON

(1859–1942)

George Aaron Barton died at his home in Weston, Massachusetts, on June 28, 1942. He was born on November 12, 1859, at East Farnham, Quebec, Canada, becoming a naturalized citizen of this country in 1900. His collegiate education was pursued at Haverford College, where he received the degrees of B.A. and M.A. (1882, 1885), and at Harvard University, gaining its M.A. in 1890, and its Ph.D. in 1891. He received *pro honore* the degree of Doctor of Letters at Haverford College (1914), and of Doctor of Divinity at Trinity College (1924). His many sided abilities enabled him to fill several more diverse posts as a teacher; he was Preceptor in Higher Mathematics and the Classics at the Friends' School in Providence (1884–89); Professor of Biblical Literature and Semitic Languages at Bryn Mawr College (1891–1922), holding a similar Preceptorship at Haverford College (1891–95); Professor of the New Testament in the Divinity School of the Protestant Episcopal Church in Philadelphia (1921–37); Professor of Semitic Languages and the History of Religion in the University of Pennsylvania, succeeding Professor Morris Jastrow (1922–32), becoming Professor Emeritus of these two last-named institutions.

Dr. Barton was elected a member of the American Philosophical Society in 1911 and served on its Committee on Library almost continuously since 1913. He was a member of the American Oriental Society, serving as its President in 1916–17; of the Society of Biblical Literature and Exegesis, serving as its President in 1913–14; of the Archaeological Institute of America, twice serving as President of the local Society of the Institute. He was a foundation member of the Linguistic Society (1925–), and a Fellow of the Royal Society of Arts, London. He took a most active part in the creation and service of the American School in Jerusalem, being its Director in 1902–03; serving later as its Treasurer, which

duty he continued upon the incorporation of the American Schools of Oriental Research, 1921–34, serving also as Director of the American School in Baghdad for the same period. The creation of the Baghdad School was first suggested by him to the Archeological Institute in 1913, but the war interfered with its immediate inception. His great service in this last capacity has been presented at length by Professor E. A. Speiser, one time Field Director of the School, in the October 1942 number of the *Bulletin* of the Schools.

A happy occasion for his many friends was the dinner given in his honor by the Oriental Club of Philadelphia, in celebration of his eightieth birthday, on November 2, 1939, attended by a large company of over a hundred guests, including the heads of the several institutions which he had distinguished.

Dr. Barton's bibliography is most lengthy and very extensive in many fields—linguistics, Semitics and the historically related languages (e.g., Egyptian, Sumerian, Hittite), interpretation of the Hebrew and Greek Scriptures with the history involved, the History of Religion, as also many utterances of his own religious faith. Consequently, only a partial list even of his books may be listed here as follows: *A Sketch of Semitic Origins* (N. Y., Macmillan Co., 1902), with a revision *Semitic and Hamitic* (Phila., Univ. of Penna. Press, 1934); *The Haverford Library Collection of Cuneiform Tablets* (from Telloh) in 3 v. (Phila., Winston, 1905–14), with a second edition of these parts in 1 v. (1918); *A Critical and Exegetical Commentary on the Book of Ecclesiastes* in International Critical Commentary (N. Y., Scribners Sons, 1908); *Commentary on Job* in Bible for School and Home (N. Y., Macmillan Co., 1911); *Sumerian Business and Administrative Documents* (Phila., Univ. Mus., 1915); *Archaeology and the Bible* (Phila., American Sunday-School Union, 1916), 7th ed. 1937; *The Religions of the World* (Chicago, Univ. of Chicago Press, 1917), 4th ed. 1937; *Miscellaneous Babylonian Inscriptions* (New Haven, Yale Univ. Press, 1918); *The Religion of Israel* (N. Y., Macmillan Co., 1918), 2d ed. 1928; *Jesus of Nazareth* (N. Y., Macmillan Co., 1922); *Studies in New Testament Christianity* (Phila., Univ. of Penna. Press, 1928); *The Royal Inscriptions of Sumer and Akkad* (New Haven, Yale Univ. Press, 1929); *Hittite Studies* (Paris, Geuthner, nos. 1–2, 1927–32); *A History of the Hebrew People* (N. Y., Appleton-Century, 1930); *Christ and Evolution* (Phila.,

Univ. of Penna. Press, 1934); *The Apostolic Age and the New Testament,* (Phila., Univ. of Penna. Press, 1936); and a partly completed Handbook of World-Wide Mysticism in manuscript.

Dr. Barton contributed the following notable articles to the PROCEEDINGS of the American Philosophical Society: "The Historical Value of the Patriarchal Narratives," 52 (1913), 184–200; "A New Babylonian Account of the Creation of Man," 56 (1917), 275–280; "The Present Status of the Hittite Problem," 65 (1926), 232–243; "The Origins of Civilization in Africa and Mesopotamia, Their Relative Antiquity and Interplay," 68 (1929), 303–312, and "The Palaeolithic Beginnings of Religion—An Interpretation," 82 (1940), 131–149.

In the Bryn Mawr Alumnae *Quarterly,* November 1919, there was published an admiring Appreciation of Dr. Barton, containing warm personal sketches by two of his alumnae, a faculty colleague, and Professor Morris Jastrow, the latter reviewing at length his contributions in the Oriental field. To this is added his bibliography up to date, presented in five two-column pages of large format. There remains the necessity of publication of an inclusive bibliography, covering the twenty-odd subsequent years of his activity, and a particular desideratum is the publication of his Autobiography, now in the hands of his devoted wife, with its lively, intimate reminiscences of the many different circles, collegiate, scientific, religious, who profited from him, and of friends who loved him. They have lost not only a philosopher, as in the language of this old Society, but still more a remarkable, unforgettable man.

JAMES A. MONTGOMERY

FRANZ BOAS

(1858–1942)

With the passing away of Franz Boas, American anthropology loses one of the foundation pillars of its structure and one of its foremost workers. With him passes, too, perhaps the last general anthropologist, equally at home in most of the branches of the science.

Dr. Boas, of Jewish extraction, was born in Minden, Westphalia, July 9, 1858, and educated in Germany. He attended the Universities of Heidelberg, Bonn, and Kiel, and in 1881 received from the latter the degree of Ph.D. At first he seemed to be destined to

become a physicist, or a mathematician, or a geographer; but he must soon have had an inclination also towards ethnographic studies, which, in 1883, changed the whole course of his life. In this year he was enabled to accompany, on the ship *Germania,* a geographical expedition to Baffin Land and Cumberland Sound, where he stayed until 1884 and began his studies on the Eskimo. His first contributions to these studies, in the form of letters, appeared in Germany already in 1883–84, and in the latter year was published also his first contribution in English, "A Journey in Cumberland Sound and on the West Shore or Davis Strait" (*Jour. Amer. Geog. Soc.,* 16: 242–272).

In 1885–86 followed trips to the Indians of Vancouver Island and the Northwest Coast resulting, during 1886–88, in several papers in German and English on the linguistics, ethnology, and mythology of those parts. In 1885–86 also he became an Assistant in the Royal Ethnographic Museum of Berlin, as well as a Private Docent of Geography at the Berlin University. About 1887—the exact date is uncertain—he emigrated to America; in 1889–92 acted as a Docent in Clark University; in 1892–94, under Professor F. W. Putnam, prepared the anthropological exhibits of the World Columbian Exposition in Chicago and, with a group of his students, undertook extensive measurements on the Indians; in 1895 became connected, first as Assistant Curator and later as Curator, with the American Museum of Natural History in New York; and in 1896 was appointed a Lecturer in Anthropology at Columbia University, becoming in 1899 a full Professor, a position which he held until the end of 1936, when he retired as Emeritus. Meanwhile, from 1902 to 1919, he was also connected as a Philologist with the Bureau of American Ethnology in Washington without, however, ever living in that city; and in 1917 founded the *International Journal of American Linguistics.* In the course of time he made several study trips to the Northwest Coast, was chiefly instrumental in organizing and directing the Jesup North Pacific Expedition, edited (and partly wrote) its valuable reports, and with the help of his collaborators and others gathered from the Northwest Coast tribes one of the richest extant ethnographic collections, the pride of the American Museum. In 1900 he was elected a member of the National Academy of Sciences, and in 1903 a member of the American Philosophical Society.

The above is a bare gross outline of Dr. Boas' course as an anthropologist. Its many details, his approximately three hundred published contributions on most phases of the subject, his activities and influence in the scientific societies of the branch, the heritage which he has left, must be left for him who will write his detailed biography, which if to be thorough and unbiased will be no small or easy undertaking.

The present writer knew Dr. Boas for nearly half a century, had high regard for him, and collaborated with him on a number of occasions, one of which contributed to the founding of the American Anthropological Association. His services to American anthropology and particularly to the cultural branches of it, were very great. He was not only a hard and prolific worker himself, but he brought out a line of students, some of whom have achieved national prominence, and he aided generously many others.

In his scientific opinions Dr. Boas was not always fortunate, or unopposed. This applied to his older views on the origin of the Eskimo, on the autonomy of the American cultures, on the stature of mixbloods among the Indians, on the head changes in Italian and Jewish children under American environment, on the practical equality of different human groups; and in some other particulars. Some reasons for this were, the want at the time he reached his conclusions of much important evidence discovered later; his reliance in cases on one hand on the help of others, and on the other on a predominantly statistical treatment of the data; the great complexity of some of the problems, together with his rather uncompromising nature, and, towards the last, some unjustified, nevertheless present, feelings connected with his Jewish derivation. However, all his work bore the mark of high erudition, and even if not always or wholly accepted, carried with it a strong stimulus and challenge for further efforts. Nor is it yet certain that some of the contested work, such as that on the head changes in the immigrants' children, does not contain a kernel of truth.

The last years of Dr. Boas' life were embittered by the accidental loss of his excellent wife; by the results of a facial operation which left partial paresis of the right side of the face and made his talk at first almost unintelligible and later difficult; by the retirement as head of the Department of Anthropology of the University; and during the last three years above all by the fate of his people, and of German civilization in general.

Dr. Boas died on December 21, in his eighty-fifth year, of a heart attack, while attending a luncheon at the Men's Faculty Club of Columbia University.

ALEŠ HRDLIČKA

SIR WILLIAM HENRY BRAGG

(1862–1942)

The last four decades have seen the ship of knowledge make a hazardous passage from the quiet waters on whose banks grew the peaceful foliage of classical theory through turbulent streams and rocky fjords to a new land where again there is beautiful scenery, but of a kind drastically different from that to which our youth had accustomed us. In this difficult journey there were certain staunch and trustworthy pilots, men who, while they proceeded with conservative caution, yet feared not to plough on when the clouds were dark, in the full confidence that there was bright sunshine behind them. This worthy group of pilots which numbered in its ranks Lord Rutherford, Sir J. J. Thomson, and Sir Oliver Lodge, and finally Sir William Bragg, has passed on.

It is sometimes difficult for the young physicist of today to realize the strength of those bonds and of that mental discipline which bound the older generation with such firmness to a line of thought which had become anchored, apparently with final security, between the rocks fashioned by Newton and Galileo. Even as late as 1904, Arthur Schuster, one of the great figures in the optics of a past generation, in lamentation over what were then the almost unacceptably radical ideas of Maxwell's theory, wrote: "The study of physics must be based on a knowledge of mechanics, and the problem of light will only be solved when we have discovered the mechanical properties of the aether." Writing in another place, of Maxwell's equations, he remarked: "Those who believe in the possibility of a mechanical conception of the universe and are not willing to abandon the methods which from the time of Galileo and Newton have uniformly and exclusively led to success, must look with the gravest concern on a growing school of scientific thought which rests content with equations correctly representing numerical relationships between different phenomena, even though no precise meaning can be attached to the symbols used. The fact that this evasive school of philosophy has received some countenance

from the writings of Heinrich Hertz renders it all the more necessary that it should be treated seriously and resisted strenuously.'' It was in such conservative schools of thought that men like Sir William Bragg were reared.

In contrast to his illustrious contemporaries, Rutherford and Thomson, who became eminent as investigators in their early youth, Bragg, although naturally a successful student and an exceptionally successful teacher, did not start to contribute as an original investigator until eighteen years after he had departed from Cambridge to accept the Professorship of Mathematics and Physics at the University of Adelaide. Indeed, he was forty years old when his first paper was published. It is very evident, however, that this long period of apparent inactivity was not one of hibernation but of pupation, for once the spark of investigation had been kindled, the fire spread with amazing rapidity, so that within three years of his first publication he had become a Fellow of the Royal Society. From then onwards he was a continual contributor of scientific papers embodying new discoveries.

Bragg's first paper on the range and ionization of alpha particles is one of the most fundamental contributions to the science of radioactivity, a field to which he continued to contribute in collaboration with R. D. Kleeman. Returning to England as Professor of Physics at the University of Leeds in 1908, his researches turned in the direction of X-rays, a field in which, at that time, there was much perplexity in attempts to correlate the wavelike expectations of the classical electromagnetic theory with certain newly discovered phenomena which seemed to call for more particle-like characteristics for the X-rays. Bragg became a strong advocate of the new and radical view that X-rays were to be regarded as particles rather than waves. It was characteristic of his whole method of thinking that his line of attack should strike with simple directness at the salient elements of the phenomena under investigation; and this very simplicity of thought invited a picture of X-ray phenomena which had many vulnerable points of attack from those who were wedded to the classical picture of electromagnetic waves and had behind them the mathematical armament necessary to give those waves the power to defend themselves with considerable strength against any new adversary. C. G. Barkla became the official spokesman for the electromagnetic aspect and frequent passages of arms occurred between the two warriors in

Nature during this period. However, it is characteristic of Bragg's broadness of mind and directness of attack upon a problem that, following von Laue's discovery of X-ray diffraction, he immediately saw that, with this new realm to be incorporated, the wave picture represented the maximum over all of simplicity, and he accepted it without equivocation. In collaboration with his son, William Lawrence Bragg, he entered the new field of investigation with enthusiasm, and father and son became among the most prominent workers in establishing the science of X-ray spectroscopy.

Bragg was invited to the Professorship of Physics at University College, London, in 1915. His time during this period was occupied almost exclusively in Government work and he became Director of the Royal Institution and of the Davy Faraday Research Laboratory in 1923. In this position, which he occupied until his death, he was a worthy successor to Michael Faraday, not only as a fruitful investigator but as an inspiring lecturer who could by his addresses incite interest in the layman as well as in the profound scholar.

Conscious of his heritage in holding the position of his illustrious predecessor, Michael Faraday, he was keenly interested in all that pertained to the history and dignity of the Royal Institution. He spent much time and thought in the publication of Faraday's diary and worked with untiring energy to bring about a very delightful and historic occasion in the Institution's celebration of the hundredth anniversary of Faraday's most vital discoveries.

Sir William Bragg was born on July 2, 1862, at Wigton, Cumberland, England. When in Adelaide, he married Gwendoline, daughter of Sir Charles Todd. The Braggs had three children, Lawrence Bragg, now Rutherford's successor at the Cavendish Laboratory in Cambridge, Gwendy, now Mrs. Alban Caroe, and Robert. He was the recipient of many honors, among them the Order of Merit, the Nobel Prize for physics, the Rumford and Copley Medals, the Barnard Medal of Columbia University, and the Franklin Gold Medal of the Franklin Institute. He was elected to the membership in the American Philosophical Society in 1940. He served as President of the British Association for the Advancement of Science, and from 1935–1940 was President of the Royal Society of London.

Sir William was one of the best loved of the world's physicists. With a dignity befitting his high standing and accomplishments he

combined a kindly disposition and a simplicity which endeared him to all with whom he came into contact. In leaving the scene of his labors so nearly in company with his illustrious contemporaries, Lord Rutherford, his old professor, Sir J. J. Thomson, and that dean of the old school, Sir Oliver Lodge, he represents one of the last of that group of investigators whose privilege it has been to guide scientific research during a period in which it has shown incalculably greater advances than during any other period in the history of man.

W. F. G. Swann

HEBER DOUST CURTIS

(1872–1942)

The passing of Heber Doust Curtis, on January 9, 1942, deprived his associates of a true friend, and the world of a scientist and scholar who was a leader in fostering the great observing tradition of American astronomy. He is survived by his wife, Mary D. Rapier Curtis; a daughter, Margaret Evelyn (Mrs. Alexander Walters); and three sons, Rowen Doust, Allan Blair, and Baldwin Rapier.

Professor Curtis was born in Muskegon, Michigan, on June 27, 1872, the son of Sarah Doust and Orson B. Curtis, and received his early schooling in the Detroit public schools. Perhaps influenced by the fact that his father was a Union veteran of the Civil War, he wished to enter Annapolis, but could not meet their height requirement. In 1889, he entered the University of Michigan, graduating with the A.B. degree three years later, having specialized in the classical languages, Latin, Greek, Hebrew, and Sanskrit. After a year of graduate study, he received his A.M. degree from the University of Michigan in 1893. His first seven years after leaving the university were spent as a teacher. During the academic year 1893–94, he taught English and Algebra in the Detroit High School, after which he became Professor of Greek and Latin at Napa College, California. In 1896 he was appointed Professor of Mathematics and Astronomy at the College of the Pacific. It was at this time that his interest in astronomy became aroused. Interestingly enough, during his four years at the University of Michigan, Curtis did not once enter the Observatory that he was later destined to direct. But the stimulus of teaching mathematics and astronomy

and keeping, as he put it, "one jump ahead of the class," attracted him to the possibilities of astronomical research. His growing enthusiasm for astronomy was encouraged by Director Edward S. Holden of Lick Observatory, where he spent several summers as a volunteer assistant.

In the summer of 1900, Curtis accompanied the Lick Observatory-Crocker Eclipse Expedition to Thomaston, Georgia, as a volunteer observer, the first of eleven such expeditions that were later to take him all over the world. Having determined to make astronomy his life work, he applied for and received the Vanderbilt Fellowship at the University of Virginia, where he studied at the Leander McCormick Observatory under Professor Ormond Stone and received his Ph.D. degree in 1902. For eighteen years, starting in 1902, Curtis was associated with the Lick Observatory. From 1902 to 1906, he served as Assistant and Assistant Astronomer, from 1906 to 1909 as Acting Astronomer in charge of the D. O. Mills Expedition to the Southern Hemisphere at Santiago, Chile, and from 1909 to 1920 as Astronomer. During the war years, 1917 to 1918, he organized and conducted a navigation school for the United States Shipping Board in San Diego, California, taught navigation at the Naval Officers' School in Berkeley, and was a Research Physicist in the Optical Section of the National Bureau of Standards in Washington, D. C., where for a time he was Acting Head of the Optical Section. In 1920, he was called to the Directorship of the Allegheny Observatory of the University of Pittsburgh, serving in that capacity for ten years. In 1930, Curtis accepted the post of Director of the Observatories of the University of Michigan, serving in that position until his death, five months prior to his scheduled retirement.

He was a member of many learned and popular societies, including, in addition to the American Philosophical Society (elected in 1920), the Astronomical Society of the Pacific (President, 1912); Fellow, The American Association for the Advancement of Science (Vice President, Section D, Astronomy, 1924); American Astronomical Society (Vice President, 1926); National Academy of Sciences; Royal Astronomical Society (Associate); Astronomische Gesellschaft; International Astronomical Union (Commission 13, Solar Eclipses); Phi Beta Kappa; Sigma Xi; and Phi Kappa Phi. He was Henry Russel Lecturer at the University of

Michigan in 1938. The University of Pittsburgh conferred upon him the honorary degree of Doctor of Science, in 1930.

Dr. Curtis' professional bibliography of 135 titles is a monument to his versatility and habit of clear-headed and concise thinking. Gifted with an unusual mechanical ingenuity, he was able to modify existing equipment or to design and build new instruments that would enable him to make the types of exacting observations he felt were a prerequisite for an understanding of the nature and workings of the universe. His researches were as varied as they were fundamental, including contributions to the fields of meteors, cometary orbits, stellar positions, asteroid observations, stellar spectroscopy, orbits of spectroscopic binaries, photographic studies of comets, solar eclipses, galactic and spiral nebulae, cosmogony, and instruments.

Probably the most fruitful of Professor Curtis' researches were carried out during his association with the Lick Observatory. Curtis joined the staff one year following the assumption of the Directorship by W. W. Campbell. Under Campbell's leadership, Curtis participated in an ambitious project for measuring the radial velocities of all the stars in the northern skies brighter than magnitude 5.5. This program and others established standards of precision that have made Lick Observatory renowned for its high-quality observations. As a by-product of the radial velocity program, Curtis discovered many new spectroscopic binaries and computed their orbits. A southern counterpart of the radial velocity program was pursued by Curtis at Santiago, Chile, while he was in charge of the D. O. Mills Expedition.

While in Chile, Curtis found time to make spectrographic and photographic observations of Comet Morehouse, in 1908. His return to Lick in 1909 coincided with the re-appearance of Halley's great comet. From September 1909 to July 1910, Curtis made 360 photographs of this famous visitor, a collection that should be of immense value to the astronomers of 1985, when Comet Halley is expected to return once more.

In 1910, Professor Curtis began his now classic photographic studies of the planetary, diffuse, and spiral nebulae, described in Volume XIII of the *Lick Observatory Publications.* This work helped lay the groundwork for the now generally accepted view that our Milky Way system is one of hundreds of millions making up the observable universe. Curtis was particularly interested in

the "coal sacks" and starless regions in or near the Milky Way. His careful observations led him to conclude, in 1918, that "it is difficult to avoid the impression that something is blotting out everything beyond . . ." and lent strong support to the present belief that the Milky Way is strewn with great clouds of obscuring dust and gas.

The years immediately preceding and following 1920 were exciting ones for astronomers, who were then engaged in debating a question of great significance, both astronomically and philosophically. The question was whether the many thousands of spiral nebulae observed visually and on the photographic plate belonged, like the diffuse and planetary nebulae, within the confines of our galaxy, or whether each constituted a separate Milky Way of stars. clusters, and nebulae, located millions of light years from the sun. Curtis had made an extensive study of dark "lanes" in spirals. To him the almost complete absence of spiral nebulae near the plane of the Milky Way indicated a similar belt of obscuration, which suggested a close resemblance between the structures of the galaxy and of the spiral nebulae. These studies, together with the discovery of novae in spirals by him and by Ritchey, led him to champion the "island universe" theory of spirals. The evidence for the opposing view seemed equally convincing, however, and for a time, as he put it, he was practically an "Irish majority" in his vigorous adherence to the island universe theory. The issue was finally settled beyond all doubt in 1924, when Hubble's discovery of Cepheid variable stars in the Andromeda nebula with the powerful 100-inch reflector demonstrated that the nebula was not a "nebula" at all, but a stellar aggregation one million light years away.

Dr. Curtis had a love for fine instruments, which found ample opportunity for expression in the three institutions he served for over forty years. At Lick Observatory, the mechanical modifications of the Crossley reflector, which he made to facilitate his observational program, gave him as much personal satisfaction as the observations themselves. During the decade 1920–1930, when Curtis was Director of the Allegheny Observatory, his penchant for machine work and the design of apparatus found expression in the many instruments that he designed and constructed, primarily for use by the Allegheny Observatory, including those transported on four eclipse expeditions. He also built, in the Allegheny shops, a long-screw measuring engine for the Sproul Observatory of

Swarthmore College. The problems that he encountered and solved in constructing an accurate screw led him to make preliminary plans for a grating ruling engine. He always regarded a successful ruling engine as "the most perfect man-made mechanism," and was eager to try to build one. To the University of Michigan, Curtis came in 1930 prepared to design a large reflecting telescope for the University Observatory at Ann Arbor. Unfortunately, by the time he had personally completed the design and drawings of the telescope, the 1932 depression was at its "lowest," and funds were no longer available for its construction. The 97-inch pyrex disk (the gift of the late Tracy W. McGregor), which he ordered, is now stored at the Observatory, and when the time comes to build the telescope, his designs should be of great value to his successor.

Dr. Curtis' preparation for and attendance at eleven eclipse expeditions provided ideal opportunities for exercising both his mechanical talents and limitless energy. In addition to the 1900 eclipse already mentioned, he journeyed to Solok, Sumatra, in 1901, Cartwright, Labrador, in 1905, Brovary, Russia, in 1914, Goldendale, Washington, in 1918, Yerbaniz, Mexico, in 1923, New Haven, Connecticut, in 1925, Benkoelen, Sumatra, in 1926, Takengon, Sumatra, in 1929, Gerlach, Nevada, in 1930, and to Fryeburg, Maine, in 1932. One of his great disappointments was that illness prevented his attendance at his twelfth planned eclipse expedition, to Canton Island, in 1937. His spectrum photographs of the solar corona and chromosphere, obtained in 1925, in New Haven, were the first ever secured of the infra-red region of the spectrum.

Although Professor Curtis' researches reached to the observable limits of the universe, his first love was the star nearest home, the sun. Thus it was natural that he should take a deep interest in the McMath-Hulbert Observatory, whose development as a private institution was well under way when he came to Michigan in 1930. Dr. Curtis was a never-ending source of encouragement and inspiration to the writer and his associates at Lake Angelus. His contributions to the McMath-Hulbert Observatory cannot be assessed too highly.

During the last eleven years, Professor Curtis and the writer were together constantly, both socially and professionally. First, last, and always, Heber D. Curtis was a man. Sympathetic understanding was always available for those in need; clear-headed, concise thinking about all problems was one of his many fine charac-

teristics, but when the situation demanded, he could be all "iron." To the highly privileged writer, he was always a "guide, philosopher, and friend."

Astronomers will recall the note by Campbell at the time of the 1900 eclipse: "We do not see how we could have dispensed with his services, nor how anyone could have met the exacting demands better than he did."

ROBERT R. McMATH

FRANCIS IRENEE DU PONT

(1873–1942)

Francis Irenee du Pont, research chemist, senior partner of a New York Stock Exchange firm, and a descendant of the founder of E. I. du Pont de Nemours & Company, died in New York City on March 16, 1942.

He was born on December 3, 1873, at Wilmington, Delaware, son of the late Francis Gurney du Pont, one-time acting President of E. I. du Pont de Nemours & Company, and Elise Simons du Pont, formerly of Charleston, South Carolina. He entered the class of 1894 at the University of Pennsylvania, and from there transferred to the Sheffield Scientific School at Yale University, from which he graduated in 1895.

On September 1, 1897, Francis I. du Pont married Marianna Rhett, of Charleston, South Carolina. He is survived by Mrs. du Pont and seven children: Emile Francis, Director of Nylon Production for the du Pont Company; Hubert Irenee, who carries on at the Delaware Chemical Engineering Company; Edmond and Alfred Rhett, partners in the investment firm; Mrs. Earl M. Elrick of Buenos Aires; Mrs. Powell Glass, Jr., of Quantico, Virginia; and Mrs. Taleasin Davies, Jr., of Denver, Colorado.

His first employment was as a Chemist at the Carney's Point plant of the du Pont Company, of which he later became Superintendent. In 1903, he established and became first Director of the du Pont Company's Experimental Station, which since its inception has been a vital factor in the expansion of the Company's business. Shortly thereafter, he became a Director and Vice President of E. I. du Pont de Nemours & Company. He remained on the Board until 1915.

He was considered one of the family's greatest members and was certainly the most versatile. He made substantial contribu-

tions to his times in the fields of invention, business, and finance. His discoveries in the field of smokeless powder, and his development of the minerals separation process, popularly known as the "sink or float" process, were particularly notable. The E. I. du Pont de Nemours & Company purchased the patents on this process in 1936. In all, Francis I. du Pont held more than one hundred patents in his own name.

In 1917 he built his own experimental laboratory, incorporated as the Delaware Chemical Engineering Company, where he developed processes that led to the organization of the Ball Grain Explosives Company, a manufacturer of fuses during the World War. Many of his inventions were perfected by him in this laboratory. He was elected a member of the American Philosophical Society in 1930.

In 1931, he organized the investment firm of Francis I. du Pont & Company, where later he was assisted by two of his sons, Edmond and Alfred Rhett du Pont. The firm took part in a number of mergers, always increasing in size and prestige. Mr. du Pont was active in its affairs until his last illness.

During his life Francis I. du Pont met both brilliant success and deep adversity. His attitude and demeanor gave no clue to his fortunes of the moment. He was kind and considerate of all who met him. He traveled in humility with the rich and powerful, the possessors of inventive genius, the scholars and teachers, the active workers, and the poor and unfortunate. All of these he treated alike. His unpublished benefactions were many and varied. For years he was afflicted with deafness. This in no way affected the tranquility of his nature, his acute sense of humor, or his delight in the company of others.

He was not only a substantial contributor to the welfare of his generation; he was also a character much beloved by those who knew him.

MORRIS DUANE

CHARLES DOWNER HAZEN

(1868–1941)

Charles Downer Hazen was born in Barnet, Vermont, March 17, 1868, and died in New York City, September 18, 1941. In 1901 he was married to Sara Sefton Duryea, who survives him.

After receiving his bachelor's degree at Dartmouth College in 1889, Hazen spent a year in graduate study in Johns Hopkins University, followed by two years abroad where he attended the Universities of Göttingen, Heidelberg, and Paris. In 1893, he received the degree of Ph.D. from Johns Hopkins, with a dissertation subsequently developed into a book entitled *Contemporary American Opinion of the French Revolution* (1897) which became the standard work on that subject. Meantime, he had begun an exceptionally successful teaching career at Smith College (1894–1914); many years later the College expressed its appreciation of his service as teacher and scholar by conferring on him the degree of LL.D. In 1916, he was called to a Professorship of History in the Faculty of Political Science at Columbia University, where he remained in active service for the next twenty years. In 1937, after a period of serious ill health, he retired as Professor Emeritus. A Columbia colleague has said of Professor Hazen's teaching, as well as of his writing, that it was "characterized by moderation and balance, formal excellence, perfect clarity, and an urbane sense of humor." "He gave himself generously to the students who worked under his guidance," and who profited by his exceptional knowledge of the literature of his subject.

Professor Hazen's contributions as scholar and writer were chiefly in the field of modern European history, with a special interest in the French Revolution. Probably the most widely read of his books was his *Europe since 1815,* first published in 1910 and issued later in a revised and enlarged edition (1923). Planned for the general reader as well as the college student, it served both purposes admirably. A competent critic noted the author's ability to tell his story simply and clearly, "without sacrificing that dramatic feeling toward great events by which alone they are realized in impressive pictures" (F. Schevill in *American Historical Review,* XVI, 625). Professor Hazen's special studies of the French Revolution were most fully embodied in his *French Revolution* (two volumes, 1932). Some of his conclusions provoked dissent; but the book as a whole was recognized as a notable American contribution to the literature of the subject. Perhaps his chief limitation as a historian, from the standpoint of a younger generation of scholars more concerned with "social history," was his preoccupation for the most part with political events, personalities, and movements.

Not the least of Professor Hazen's services was his promotion of contacts between French scholarship and that of his own country. His visits to France were frequent—often for considerable periods of time—giving him a sympathetic understanding of French life and thought beyond that of most American scholars. Among the distinguished French historians whom he knew personally were Gabriel Hanotaux and J. J. Jusserand. The circle of his acquaintances included some of the outstanding personages in the political life of France during the World War of 1914 and the early post-war years. In 1920–21, he served, on the invitation of the French government, as a Visiting Professor at the University of Strasbourg. For some thirty years a large proportion of the review articles in the *American Historical Review* dealing with French studies of the Revolution and the nineteenth century came from his pen.

In addition to the previously mentioned degree from Smith College, Professor Hazen received honorary doctorates in letters from Hobart and Rollins Colleges, and from his alma mater, Dartmouth. He was a prominent member of the American Historical Association, participating in several of its programs. At one session during the World War, he presented one of three notable papers on the peace congresses of the nineteenth century which were subsequently collected and published in book form; his own contribution dealt with the Congress of Vienna.

In recognition of the literary quality of his work, he was one of the comparatively few historians elected to membership in the American Academy of Arts and Letters. French appreciation was shown by his membership in the Société d'Histoire Moderne and the Institut Internationale de la Révolution Française. He was also a Chevalier of the French Legion of Honor. He was elected to membership in the American Philosophical Society in 1923.

EVARTS B. GREENE

ROBERT HENDERSON [1]

(1871–1942)

In the death of Robert Henderson on February 16, 1942, American mathematics lost one of its ablest leaders. Those who came into close association with him were deeply impressed not

[1] Reprinted from *Bulletin of the American Mathematical Society*, July 1942, 48: No. 7, 504–505.

only by his ability but even more by the integrity of his intellect and character; they could not but feel that it was a privilege to know a man of such extraordinary parts.

Mr. Henderson was born in Russell, Ontario, on May 24, 1871. He graduated from the University of Toronto in the Honours School of Mathematics at the head of his class in 1891 and received an appointment as Fellow in Mathematics for the following year. In 1892 the young man entered the Government Insurance Department at Ottawa and by 1896 he had passed the examinations of the Institute of Actuaries of Great Britain and had become a Fellow. Soon thereafter he entered the employ of the Equitable Life Assurance Society of the United States and transferred his residence to this country. Here he progressed rapidly to the top of the profession and became Actuary in 1911. In 1929 he was made Vice President of the company, which position he held until 1936 when he retired.

While nearly all of the two score papers which he published were concerned with actuarial problems, he never lost his interest in pure mathematics. As early as the meeting of October 1895 he presented a paper to the American Mathematical Society which was published in November of the same year. It is entitled "Moral values" and deals with some fundamental relations between probability and insurance. He was an omnivorous reader and found time to keep up with many of the modern developments of mathematics. In the *Annals of Mathematics,* volume 24, he has a brief paper entitled "Geodesic lines in Riemann space," which was stimulated by his interest in the theory of relativity.

Mr. Henderson was prominent in the counsels of the Actuarial Society and served a term as Secretary, four years as Vice President, and two years as President. His contributions to the advancement of theory in the actuarial field were varied in character, but his work on interpolation and graduation and on frequency curves and moments is perhaps the best known.

In the early days of the Society, Professor Emory McClintock, who was its President for the period 1891–94, made a profound impression on the development of actuarial science in America; Mr. Henderson proved to be a worthy successor. He was the recipient of many honors; for his signal leadership in his field his alma mater honored him with the degree of Doctor of Science in 1930. For the Annual Meeting of 1924 in Washington, the Society invited

him to give the Josiah Willard Gibbs lecture; his title was "Life insurance as a social service and as a mathematical problem" (see *Bull.* (1925), **31**: 227–252). In 1927 he was elected to membership in the American Philosophical Society.

R. D. MURPHY,
R. G. D. RICHARDSON

HERBERT FOX

(1880–1942)

Herbert Fox, the son of Samuel Tucker Fox and his wife Hannah Ray Freas Fox, was born at Atlantic City, New Jersey, on June 3, 1880. After graduating from the Central High School of Philadelphia he studied medicine at the University of Pennsylvania, receiving the degree of M.D. in 1901.

From the outset of his professional career Dr. Fox devoted himself to pathology, and with this end in view he went to Vienna for postgraduate work immediately after his graduation. Upon his return to Philadelphia, he became an Associate in the William Pepper Clinical Laboratory at the University of Pennsylvania, of which in 1911, he was appointed Director, resigning from the position of Chief of the Laboratory of the Philadelphia Department of Public Health which he had held since 1906, in order to fulfill the duties of his new position. For many years he was Pathologist to the Rush Hospital for Consumptives and the Children's Hospital of Philadelphia. Dr. Fox's interest was especially concerned with comparative pathology, to the literature of which he made many valuable contributions. In 1906 he was appointed Pathologist to the Philadelphia Zoological Society and in the Zoological Gardens he found ample material of which he made good use. In 1927 he was appointed Professor of Comparative Pathology in the University of Pennsylvania. Dr. Fox resembled John Hunter in the eagerness with which he sought opportunities to study pathological conditions in animals other than man, sparing no time or energy to acquire specimens to enrich his valuable collections. He suffered from a severe degree of deafness, which did not interfere with his entering the Army in the First World War, when he served as Chief of the Laboratory at Camp Zachary Taylor, with the rank of major.

In spite of his deficiency in hearing Dr. Fox was a most delightful companion, always cheerful and enjoying the society of others, as well as adding to their enjoyment. He was a member of many professional organizations, such as the American Association of Pathologists and Bacteriologists and the College of Physicians of Philadelphia, serving as a member of the Council of the latter for some years. He was a member of the Academy of Natural Sciences of Philadelphia, and was elected a member of the American Philosophical Society in 1932.

Dr. Fox married Louise Carr Gaskill in 1904, by whom he had three children. She died in 1933 and in 1938 Dr. Fox married Mary Harlan Rhoads. Dr. Fox died on February 26, 1942.

FRANCIS R. PACKARD

SIR JOSEPH LARMOR

(1857–1942)

The death of Sir Joseph Larmor on May 19 removes one who took a dominant part in the transition from the physics of the nineteenth to that of the present century. Larmor was born in County Antrim, Northern Ireland, on July 11, 1857. After graduating, with the highest honors, from Queen's College, Belfast, he entered St. John's College, Cambridge. In the Mathematical Tripos of 1880 he came out as Senior Wrangler, J. J. Thomson being second. Larmor was then appointed Professor of Natural Philosophy in Queen's College, Galway; he held this post until 1895 when he returned to St. John's College as Lecturer. On the death of Sir George Stokes in 1903 Larmor succeeded to the Lucasian Professorship, the famous chair once held by Newton. He retired in 1932 and spent the last years of his life at Holywood, County Down, Northern Ireland.

Larmor's work was wholly theoretical and covered nearly the whole field of physics, with excursions into astronomy and geodesy. His *Mathematical and Physical Papers* published in two imposing volumes in 1929, are evidence of the wide range of his interests. He delved deeply into the historical development of physical theories, believing that the main features of physical speculation do not pass out of date, but rather become a permanent part of science.

One of his earliest papers, published in 1884, was entitled "On Least Action as the Fundamental Formulation in Dynamics and

Physics,'' and much of his later work was concerned with the application of this principle to various branches of mathematical physics. This principle he used as the foundation for his most important work, a series of papers begun in 1893 on ''A Dynamical Theory of the Electric and Luminiferous Medium.'' Later he incorporated a portion of this work, in a revised form, in his book *Aether and Matter,* published in 1900, an essay for which he received the Adams prize in the University of Cambridge. In this work his purpose was to develop a general electromagnetic theory based on the atomic structure of electricity. The aether of Larmor was not the aether of the nineteenth century—a special form of matter to which definite physical properties were ascribed. His conception of the aether can best be given in his own words:

It is not superfluous to repeat here that the object of a gyrostatic model of the rotational aether is not to represent its actual structure, but to help us to realize that the scheme of mathematical relations which defines its activity is a legitimate conception. Matter may be and likely is a structure in the aether, but certainly aether is not a structure made of matter. This introduction of a suprasensual aethereal medium, which is not the same as matter, may of course be described as leaving reality behind us; and so in fact may every result of thought be described which is more than a record or comparison on sensations.

One of the outstanding difficulties in the nineteenth century conception of the aether was its failure to account for the experiments that had been made on the influence of the earth's motion on optical and electrical phenomena, particularly the negative result of the Michelson-Morley experiment. To this problem Larmor devoted much attention in the papers that have been mentioned. His contemporary, H. A. Lorentz in Holland, was also working on this problem, and although their methods were very different most of their results were in substantial agreement. It is not easy, nor is it very important, to fix definitely the part that each contributed. On account of his involved style of writing Larmor's work perhaps did not become so well known at first as that of Lorentz, whose methods were rather more direct, but his influence in stimulating the new generation of physicists along new lines of thought was very great, and he has left behind him a very solid achievement of valuable work well done.

At the invitation of Columbia University Larmor visited the United States in 1906 as a non-resident lecturer in mathematical

physics. He was elected a foreign member of the American Philosophical Society in 1913.

E. P. ADAMS

TULLIO LEVI-CIVITA

(1873–1941)

Tullio Levi-Civita was born at Padua, March 29, 1873. His father was a well-known lawyer and prominent citizen, one time Mayor of the City of Padua and Senator of the Kingdom. Levi-Civita was born soon after the unification of Italy and remained all his life the same ardent liberal as his father. Needless to say this did not make things easier for him during the last twenty years.

He spent his early life in his native city, obtaining his doctorate there at the age of twenty-one and was appointed to a Chair of Mechanics at Padua four years later. In 1918 he was appointed to the Chair of Theoretical Mechanics at the University of Rome and held this position until his dismissal for racial reasons in 1938. He died in Rome on December 29, 1941.

When Levi-Civita was a student at Padua his teacher Ricci was continuing his studies of Riemannian manifolds from the invariantive point of view and developing what now is known as absolute differential calculus or tensor analysis. Levi-Civita made use of this calculus in the field of mechanics and other branches of physics. In 1901 Ricci and Levi-Civita published in the *Mathematische Annalen* a memoir entitled "Méthodes de calcul différentiel absolu et leurs applications" which did not at the time attract much attention. More than a decade later this mathematical mechanism was used by Einstein in his general theory of relativity. There followed an extensive study of Riemannian manifolds in which Levi-Civita took a leading part. His most notable contribution was the introduction of the concept of parallelism in these manifolds. This concept was generalized to manifolds without a metric and led to the development of various types of non-Riemannian geometries. In 1925 he published his standard work *Lezioni di calcolo differenziale assoluto,* which was translated into English and into German.

Although he is chiefly celebrated for his work in differential geometry, it is not too much to say that no branch of theoretical and applied physics was without contribution from Levi-Civita. Especially noteworthy was his work on the problem of three bodies.

The problem of two bodies in relativity, whose difficulties are only too well known, preoccupied him to the last, together with the revision of his text book on analytical mechanics written in collaboration with Amaldi which is a classic. His contributions of note are not limited to these fields extensive and varied as they are, but are to be found throughout the whole domain of mathematics pure and applied. Not only was his knowledge of mathematical literature encyclopaedic but his grasp of contemporary mathematics was equally profound.

A man of such high distinction could not fail to be the recipient of many academic honors. He was a member of numerous societies and scientific associations in Europe, in particular, of the leading academies of Italy being expelled from these in 1938 for racial reasons. It was significant at the time that he remained a highly honored member of the Pontificial Academy of Sciences where he was duly commemorated shortly after his death. He was a foreign member of the Royal Society of Great Britain and of the American Philosophical Society. He visited the United States several times. In particular he was a delegate to the Chicago World Fair of 1935 and lectured at the time at Brown, Harvard, and Princeton Universities. He was likewise invited as delegate and lecturer to the Harvard Tercentenary Celebration of 1936 and spent the first term of 1936–37 as Visiting Professor at the Institute for Advanced Study.

Although Levi-Civita was rather frail, all his life he was energetic—an ardent worker, an enthusiastic lecturer and he gave himself to his students and colleagues unsparingly. Great as were his accomplishments, he is remembered also as an unusually modest and courteous man, a delightful host, and a loyal friend.

LUTHER P. EISENHART

GEORGE W. NORRIS

(1864–1942)

George W. Norris, a distinguished citizen of Philadelphia, and, during the latter years of his life, an active member of the American Philosophical Society, died at his home at Penllyn on May 13, 1942, at the age of seventy-eight.

Mr. Norris had a distinguished career. Educated as a lawyer, he practiced for some years at the Philadelphia Bar, and in 1886

he entered the banking firm of Edward B. Smith and Company. In the administration of Mayor Blankenburg, he was Director of the Department of Wharves, Docks, and Ferries, and greatly increased the facilities of the Port of Philadelphia. From 1911 to 1915 he was Vice Chairman of the Federal Reserve Bank of Philadelphia. From 1916 to 1920 he was a Federal Farm Loan Commissioner, and during that period established on a sound foundation a system of federal farm loans. For sixteen years he was Governor of the Federal Reserve Bank of Philadelphia.

Deeply interested in government—municipal, state, and national, he remained throughout his life an outstanding citizen. He was a man of wide intellectual interests, and devoted to the aims and purposes of the American Philosophical Society. In later years he was a member of the Finance Committee of the Society, and brought to the Committee's activities a wide experience in financial affairs, and a mature and balanced judgment.

ROLAND S. MORRIS

STEWART PATON

(1865–1942)

In the sudden death of Stewart Paton of a heart attack on January 7, 1942, American Science lost a pioneer in the field of psychiatry and human behavior, and the American Philosophical Society a member of distinction who has been seen only rarely at its meetings in recent years, but whose memory will be cherished by all who were privileged to know him. He was born of a distinguished family in New York City in 1865, attended Princeton University and received the degree of A.B. in 1886 and A.M. in 1889. He graduated with the degree M.D. from the College of Physicians and Surgeons of Columbia University in 1889, and after doing graduate work in neurology and psychiatry with Kraepelin in Germany he was associated with the leading men in the Medical School of Johns Hopkins University during its formative period. Dr. Adolf Meyer, Director Emeritus of the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital, says in an obituary note:

When I first knew him in 1897, he was already an influential leaven in the Johns Hopkins Medical group, with a specific interest in the growth of the nervous system, the arrangement of the cells in the cortex, the nature and role of the thalamus. From the start

he was active also in urging and furnishing the same degree of orientation and perspective in the work with mental disorders and mental problems.

During this period he became Director of the Research Laboratory of the Sheppard and Enoch Pratt Hospital for mental patients. Many students and associates of that period, who have since become leaders in psychiatry, gratefully acknowledge the direction and inspiration received from him. Dr. Meyer continues:

By 1905 Paton had encouraged a flow of contributions from his group of disciples, and in a stimulating book (*A Textbook of Psychiatry for the Use of Students and Practitioners of Medicine.* Lippincott, 1905), he put forth a remarkably illustrative presentation of the workings and contemporary publications in psychiatry of the nineties and the beginning of the new century. Throughout that period he worked and wrote and preached the practical doctrine of the need of psychiatric clinics and centers and standards like those of Kraepelin. Without his stimulus William Osler and William H. Welch would hardly have become sponsors for the donation of Mr. Phipps in the form of the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital. Indeed Dr. Welch wrote to him, and wanted his family to know, that it was Paton who had helped him to understand the value and importance of psychiatry. With these achievements, in 1905 Paton turned to the Zoological Station at Naples to devote himself without interruptions to the study of fish embryos and the structural formulation of the functional patterns. In this remarkable center which Anton Dohern and his son created, Paton found just the type of paradise for biological work that must have given him "the time of his life."

Dr. Paton and his family spent five years abroad, mostly in Naples, and his contacts with research men at the Naples Station and in various university centers in Europe gave him a broad acquaintance with the newer problems and methods of biology and medicine. His research at the Naples Station was of a fundamental character and resulted in an important paper on the correlation of structure and function in the development of the nervous system, which was published in the *Mitteilungen aus der Zoologischen Station zu Neapel* Bd. 18, 1907. This general line of work was continued after his return to the United States in 1909 and was published in three additional papers, one in the *Journal of Comparative Neurology,* Vol. 21, 1911, another in the *Journal of Experimental Zoology,* Vol. 11, 1911, and a third in the PROCEEDINGS of the American Philosophical Society, Vol. 51, 1913. These

studies were made on different classes of vertebrates ranging from sharks to mammals, and they were of a high order of excellence. His histological preparations showing the development of neurofibrils were generally recognized as superior to any others, and his studies on the correlated development of functions represented pioneer work. Dr. George E. Coghill in his well-known book on *Anatomy and the Problem of Behavior* (Cambridge University Press, 1929) pays tribute to Dr. Paton as one of the first explorers in this field.

On his return from abroad he and his family settled in Princeton and in 1911 he became Lecturer in Neurobiology in Princeton University and consultant on the mental health of students, in which positions he continued until 1926. During this time he turned his attention more and more to the great and almost unrecognized need for caring for the mental health of students as well as for their physical health. I think it astonished him as I know it shocked members of the faculty to find that not a few students were greatly in need of mental hygiene. Of this work he wrote:

> I started the conferences with students at Princeton in 1910. . . . When a student came voluntarily to ask my advice or was referred to me by some members of the faculty I assembled all the data I could collect about the student and concerning his adjustments or maladjustments to the university environment. . . . In some cases the data, or rather a summary of them, were given to the student and if necessary to parents and guardians. The information received was treated as confidential, and I used my judgment in deciding to whom the information should be given. Among the cases that needed immediate attention and care were students who had pronounced suicidal, homocidal impulses, sex perverts, those who stole, cheated, were exceedingly egotistical, aggressive and showed other signs of serious maladjustment.

Paton recognized that this was a field almost wholly neglected by colleges and universities and in numerous addresses and articles he called the attention of trustees and faculties to its supreme importance. Among his publications growing out of this work and conditions leading to the War of 1914–18, which he regarded as the result of perverted or false education, were four books, namely: *Education in War and Peace* (1920); *Human Behavior in Relation to the Study of Educational, Social and Ethical Problems* (1921); *Signs of Sanity and Principles of Mental Hygiene* (1922); *Prohibiting Minds and the Present Social and Economic Crisis*

(1932). His last book and testament was almost ready to be published at the time of his death.

In 1926 he moved to Yale University where he inaugurated work similar to that which he had done at Princeton. He also had a share in the organization of the "Institute of Human Relations" at Yale. He remained there for two years and then went to Johns Hopkins for several years. More recently he has lived in or near New York where he has continued his literary activities.

He was for a time Lecturer in Psychiatry at Columbia University, where he was closely associated with the late Dr. Thomas Salmon. He took an active part in the organization and development of the National Committee for Mental Hygiene; was a Trustee of the Carnegie Institution of Washington and of the Josiah Macy Jr. Foundation; member of the Eugenics Research Association (President 1919); member of the New York Academy of Medicine, of the Harvey Society, of the American Neurological Association, of the American Society of Naturalists, fellow of the American Association for the Advancement of Science; he was elected to membership in the American Philosophical Society in 1914. Dr. Paton took an active part in the organization of the Neuropsychiatric Service in the World War and was assigned to active service in that branch with the rank of major.

This brief sketch of Stewart Paton would be most incomplete if it contained no reference to his charming personality. He was one of the most amiable men I have ever known. Sincere, generous, helpful, and withal modest to a fault. He started many important movements and reforms, but avoided all claim to recognition. He wanted no publicity for himself and gladly gave credit for projects which he initiated to his associates and successors. Indeed when he had seen a project well launched he frequently turned to new enterprises, leaving to others the task of carrying on. Probably his most important work was that of instigator and organizer. Many friends and former associates have applied to him such phrases as "his kindly and gentle manner," "his engaging personality," "his rare serenity and poise," "his most lovable personality." Of him it could be said with literal truth, "None knew him but to love him."

In 1892 he married F. Margaret Halsey and their ever-hospitable home, whether in Baltimore, Princeton, or New Haven, was a gathering place for students and faculty members, and scientific and

professional leaders from far and near. It is a joy to recall those delightful occasions when conversations ranged over literature and art as well as science, and a spirit of geniality and good fellowship prevailed over all. Theirs was a happy home that illustrated the principles of the good life which Dr. Paton preached and practiced. His wife and three children, a daughter, F. Evelyn (Mrs. Capt. Powell, U.S.N.), and two sons, William and Dr. R. Townley, survive.

EDWIN G. CONKLIN

SIR WILLIAM MATTHEW FLINDERS PETRIE

(1853–1942)

On June 3, 1853, there was born to William Petrie and his wife, Anne Flinders, an only child whom the parents christened William Matthew Flinders. Nearly ninety years later, on July 28, 1942, Sir Flinders Petrie died in Jerusalem—Fellow of the Royal Society, Fellow of the British Academy, with a whole line of honorary degrees after his name, and a record of over forty years of active service as Edwards Professor of Egyptology at University College in London. For sixty years he was the best known among English excavators; more men and women had their first start under him than under any other English Egyptologist; and his name was a byword wherever any interest was shown in the Valley of the Nile.

His autobiography starts: "The first chance in life is ever being born at all, and a mighty uncertain affair it seems to us mortals." One gathers that for the little Petrie this was no exaggeration. He was too sickly to go either to school or to a university, but breathed in what he knew from a remarkable lot of relatives, connections and family friends who made up the earliest of his acquaintances. The first chapter in his life has him collecting coins, measuring churches and druid ruins all over southern England, walking from site to site with his pockets filled with bread and cheese as his only food, and toward evening his eye peeled for a farm house to sleep in. He was always the same Petrie, self taught, brilliant, and apparently able to digest anything after a fashion, but so often just lacking something.

In 1880, when he was twenty-seven, Petrie had acquired some surveying instruments and put all the money his father could spare into various sorts of equipment, and off he went to measure the Pyramids of Egypt, those monuments which his family connection,

Piazzi Smythe, was saying were filled with prophecies of every event which was to befall to—of all people—the Children of Israel and the British Race. When he started out he had no real interest in Egypt, but he drank Nile water and they say one always comes back for more. It was a job which took him two winters in all and which ended in his absolute conviction that there was not an iota of truth in the whole rigamarole, but he was wise enough to know that nothing in the world could budge a believer. Their maunderings were disproved, but they had created unwillingly an entirely new school of archaeology.

Mariette, director of the Service des Antiquités, and Emil Brugsch, keeper of the Egyptian Museum, were his particular hates at this time. Maspero, who came out to Egypt to succeed Mariette in 1881, he seems to have barely tolerated. For Amelia Edwards, of the Egypt Exploration Fund, Edouard Naville, its excavator, and the officials of the British Museum, he had anathemas of various strengths. The Arabs who worked for him he seems to have thought of as one might of rather pleasant but hardly trustworthy children. In fact, an unqualified admiration for anyone is never to be found in his judgment of their characters, and while he may have been hard, he was often very nearly right. And that was not all. His great complaint seems to have been that no one could tell him more than his own natural gifts already made clear.

However, someone with more insight than most gave Petrie a job on the Fund and in 1883 off he went to dig at Tanis in the Delta where Mariette had made extraordinary finds in the past. The Fund gave him no salary, but he lived, as he started in England, with the greatest frugality. In 1884 F. Llewelyn Griffith came as the first of his disciples and the next year Ernest Gardner joined them at Naukratis, which Petrie had already marked on his long rambles on foot around the Delta. In some ways those were perhaps his greatest years. He never had such followers again, and though his finds were always remarkable, it is a question whether the discovery of the early Greek colony at Naukratis was ever topped by him. But three years constituted a long time for the impatient Petrie to have stood the rather inept Fund of those days, so they parted company and he went up the Nile making a collection of casts of bas-reliefs representing foreigners for Francis Galton, and with Griffith publishing a still invaluable collection of copies of graffiti.

Meanwhile two rich Englishmen advanced the funds for some eight years' work, the proceeds being divided into three lots of which Petrie's own he eventually gave to University College, London. This was work for which he took not a penny, but which he apparently enjoyed as much as he did anything in his life. The first years he spent in the Fayyūm unearthing a large collection of remarkable second and third century Roman portraits; making his way into the intricate passages of the Hawara pyramid, and emptying out an untouched tomb filled with mummies of the Eighteenth Dynasty in a single, hectic afternoon. Now-a-days we shiver to read of what we should consider the cavalier treatment of material which we would move only in the course of arduous and painstaking months of labor. But we should never forget that whatever Petrie did in his excavations he did himself, and not by very remote control over his distant Arabs, miles and miles away, as everyone else did up to that time, nor can we measure the trouble he was having over the rag-tag and bobtailed lot of natives and Germans who were at that time gathering up antiquities for sale.

In 1890 he left the Fayyūm to dig nearby at Meydūm, and the following season at Amarna, and then at Koptos, at Nagada and at Thebes. It is extraordinary, the ingenuity with which he protected the frescoed pavements at Amarna, or divided up his men to clear the two thousand prehistoric graves at Nagada. He willingly admitted, within a year or two, that they were prehistoric and not those of a new race of savages entering the valley well over a thousand years later, as he had published them over the ardent protests of his young assistant, Quibell. Curiously enough, de Morgan, who was briefly serving as Director of Antiquities in Egypt at this time, showed that what Petrie had found was unquestionably early, and yet de Morgan was one of the few people about whom he wrote without any vitriol in his pen.

Meantime he was well established at University College as Edwards Professor of Egyptology, and he had missed his first season in the field while he organized a position which he filled with considerable ability for the next third of a century. At first there was not much pay connected with his job and it is obvious that no one else could possibly have done what he accomplished on so little, but he paid for it with broken health and he still appears to have lived largely on his extraordinary will. However, poor health and busy years could not prevent him from bringing out his remarkable

History of Egypt—a book described to me while an undergraduate at Harvard by my professor as the wastepaper which a real historian would have thrown away when his work was finished, but to this day it remains a very useful book.

In 1896 the Fund was so badly on the rocks that it needed to be rescued, and Petrie was chosen to pull it out of the doldrums. Old and Middle Kingdom sites at Deshasheh and Dendereh; prehistoric cemeteries at Diospolis Parva, by which he retrieved his error at Nagada and laid the foundation of our knowledge of that period; the early dynastic royal tombs at Abydos dug to prove Amélineau worse than a nature-faker, which he amply accomplished; the dynastic cemeteries at Abydos; and then Ehnasya and Sinaï found him fired again, in 1904, by the inept and often tortuous Fund. It made but little difference to Petrie, who could always find the money to dig with, and the last of his older helpers had other jobs—Mace with Reisner and then with the Metropolitan Museum; Davies at first copying tombs for the Research Account and after 1907 also on our expedition; and Quibell in the Antiquity Service of the Egyptian Government.

But Petrie had not changed in twenty years and while he was a great improvement on Mariette and his contemporaries, Reisner was showing the younger men another and infinitely better way to excavate. No one ever questioned Petrie's cleverness. He was in many ways the most remarkable genius it could ever be any one's fortune to meet. A paper shoe-box with a pin hole in one end and a photographic plate in the other, makes a perfectly good camera as he well knew and had often proved, but that was not enough. He took an old camera, put a bit of rubber hose in the front-board with a good sized lense in it, and had a wire fixed so that he could hold the lense anywhere he wanted it and, as he needed, crooked or not in regard to the plate. He showed me once some superb pictures he had taken with it inside the Arch of Titus of the sculptures way up in the air and far too long for the range of an ordinary camera. He had a lot of ancient weights to catalogue, and changing his own weights in the scale-pan took up too much time, so he bought a long piece of very fine chain which he weighed with a great deal of care and which he measured with equal closeness. The end of his chain was then fastened to a sliding scale above the weight-pan so that as he fed the chain into his balance he merely had to read off the length of chain in the pan and from that came

his weight automatically. I saw in New York once, the same idea used in some very accurate chemists' scales which I was told were the latest thing, more than a score of years after the idea came to Petrie in University College.

However, all of his ideas were not so good. Many used to think of them as almost all like one which he tried on me after his first night at our house in Luxor. I asked him whether he had slept well and he said he had not. The bed was too soft—not at all an uncommon fault with beds, unfortunately. Once upon a time he had been staying in the New Hotel in Assiut and it was so hot that he lay on the bed and watched the mosquito net shake above him with each beat of his heart, and he realized that all that motion was being lost to no purpose. The tale was so impressively told that I went out to retell everyone else, but all that I got was a shout of derision. One could go on by the hour telling such tales, many of them harmless, but unfortunately many of them with more hurtful outcomes. He was entirely self-taught in everything including his knowledge of Arabic, and with his Arabic he was not always wholly correct. Mace, I think it was, had a tale of his having mixed up the Arabic words for "push" and "pull," and having got an enormous coffin up to the top of a deep pit, he yelled to the workmen "push." They did, and all gave the thing a tremendous shove and it went slithering back and was smashed to pieces on the rocks below. Naturally, no fellāh would set Petrie to rights on his knowledge of the language, and from thence onwards every young Egyptian was told never to forget to "pull" when the Khawagah yelled to "push."

One should not think of Petrie as finished when he left the Fund the second time. Two third of his writings were still to appear and the choicest of his discoveries—the jewelry of Lahūn which is now the great Egyptian treasure in New York—were to come. The sale of this jewelry to the Metropolitan Museum, the subscriptions to his books, his lectures, and his very frugal personal expenses kept him going until 1926,—and then he went off to Palestine, mad with Lacau, another Frenchman in charge of the Service des Antiquités. In Jerusalem he finally died—a self-educated genius, long past his greatest days, but the possessor of a name which can never be forgotten. He was elected a member of the American Philosophical Society in 1905.

H. E. Winlock

ÉMILE PICARD

(1856–1941)

Charles Émile Picard was born in Paris on July 24, 1856, and died there on December 12, 1941. Practically his whole life was spent in Paris, the last quarter century as Perpetual Secretary of the Académie des Sciences. A profound lover of France, and more particularly of Paris, the superb view of the old city, across the river from the Louvres, which he could contemplate from his windows at the Palais Mazarin, gave him a constant and ever renewed satisfaction. And what the last year and a half of his life must have meant for this patriot, 'tis best not to contemplate. Sturdy and full of energy, a typical Parisian *pince sans rire* he has been known when in his eightieth year to discourse learnedly and at length upon whether 'twere more suitable to terminate a repast with *fromage* rather than with *fruits*.

The son of a silk manufacturer, Picard lost his father at the age of sixteen, as a consequence of illness contracted during the siege of Paris in 1871. Except for this early loss and the siege, he had the normal uneventful childhood and youth of the Parisian *bourgeois de bonne famille.* Contrary to what happens to most outstanding mathematicians, his particular bent did not appear too early and his studies were equally devoted to science and to the classics. However, greatly impressed by the ardent advice of Pasteur to devote his life to pure Science he entered the École Normale Supérieure (in preference to l'École Polytechnique) at the age of eighteen, emerging from there three years later with the full panoply of the highest French academic degrees. The promise of such an auspicious beginning was kept to the full. In 1881, aged twenty-five, Picard was called to the Sorbonne as a substitute to the distinguished analyst Bouquet in Paris and succeeded Bouquet in 1885 in the Chair of Differential and Integral Calculus. In 1897 he was appointed to the Chair of Higher Analysis which he held until his retirement (1931). He was also, beginning in 1894, Professor of Analytical Mechanics at the École Centrale, where the undersigned had the privilege of attending the superb and difficult course which he gave there. His vivid personality, his clear lectures deeply impressed his audience of budding engineers, who appreciated to the full this great scientific personality.

A holder of many honorary doctorates, and member of many academies, Picard was elected to foreign membership in the American Philosophical Society in 1910. He visited the United States twice, the first time in 1899 as invited lecturer at Clark University, the second time in 1904 as delegate to the St. Louis World Fair. His second visit was followed by a grand tour of the country. He has been honored also, as few French scientists have been, with the election to the Académie Française (1925), a testimony to his lucid style and great breadth of interest.

As a mathematician Émile Picard was above all a superb analyst, a worthy successor of Weierstrass and Riemann, for whom in spite of the Rhine, he professed a boundless admiration. He may also be considered a disciple of Hermite whose daughter became his wife. A scientific contemporary of Poincaré, he was much influenced by him, but the converse held likewise in large measure. Like Poincaré he remained wholly untouched by the mathematical revolution (the term is not excessive) caused in the eighties by the work of Georg Cantor, and whose effect no mathematician of our time has escaped.

Perhaps the two outstanding contributions of Picard are his classical theorem on essential singularities, and his theory of algebraic functions of two variables. An analytic function of a complex variable which is not rational (quotient of two polynomials) has at least one singular point a. If it is well behaved everywhere else, then arbitrarily near a it can assume all complex values with the exception of at most two. This profound and unexpected result is the famous Theorem of Picard; it was obtained by him at the age of twenty-three, and has since been the source of many investigations by first class men. In his work on algebraic functions of two variables Picard above all extended the theory created by Abel, Jacobi, Riemann for functions of a single variable. The extensions however required the overcoming of wholly new and unexpected difficulties, partly due to the topology of the systems under consideration. The classification of the integrals attached to algebraic surfaces, of their curves and the clearing up of their topology all rest in an essential way upon the fundamental work of Picard.

Other major contributions of Picard are his investigations on the partial differential equations of mathematical physics, and above all his extension to linear differential equations of the group

concepts introduced for algebraic equations by Galois (Picard-Vessiot theory).

The duties imposed upon Picard by the chair of Higher Analysis left him completely free in selecting the program of his course. Thus among the topics which he treated through the years were his own investigations on algebraic functions and on other questions, as well as the recent work of his (non-cantorized) contemporaries. Part of these lectures formed the body of his famous *Traité d'Analyse* whose three volumes have reached a third edition. It would be difficult to name a work with a more varied range of topics. It is a mathematician's book, and it helped to form generations of mathematicians. Another fundamental book by Émile Picard (written in collaboration with G. Simart), is the *Théorie des fonctions algébriques de deux variables* (1897, 1907). It contains above all Picard's own contributions to the subject, and has been a standard work of reference since its appearance.

As we have already indicated Émile Picard was far more than a "technical" mathematician dwelling in his ivory tower. A student of the classics which he cultivated from early youth, his numerous articles on the "Philosophy of Science" testify to his broad horizon. Altogether with him there has passed from the scene not only a scientist of the highest rank, but also a rare human spirit.

S. Lefschetz

JOHN STANLEY PLASKETT

(1865–1942)

John Stanley Plaskett affords a notable example of a distinguished scientific career, created, despite initial handicaps, by innate ability, courage, and character. Born the eldest of a large family on an Ontario farm in 1865, he was prevented by home obligations from proceeding to college at the usual time, and worked for several years as a skilled mechanic. In 1890 he found an opportunity at Toronto University, as a mechanician in the Department of Physics, and lecturer's assistant, such that he could pursue his studies after hours. In 1895, already three years married, he matriculated at the University, still carrying on the work which was his livelihood, and graduated with high honors in physics and mathematics in 1899.

When the new Dominion Observatory was constructed in 1903. Plaskett was appointed on the staff. He was in charge of the eclipse expedition to Labrador in 1905, and though clouds prevented observation, showed his mettle in the excellent planning of the observational program, and the design of special apparatus. With the installation of the 15-inch refractor, he embarked upon the observation of the radial velocities of stars, which remained his major interest. His mechanical skill combined with his knowledge of optics led him to great improvements in the design of the spectrograph, which produced an instrument of remarkable efficiency.

Realizing that a much larger telescope would be required to reach an adequate number of stars, he recommended in 1911 to the Director, Dr. King, the erection of a reflecting telescope with an aperture of six feet or more, larger than any then in existence. Dr. King supported the suggestion with enthusiasm. An authorization from the Canadian Parliament was required and, thanks largely to Plaskett's skill in presenting the case, this was secured in 1913, and the 72-inch disk for the mirror reached America in 1914 just before the outbreak of the war.

The figuring of the mirror (by Warner and Swasey) continued during the neutrality of the United States, and the Dominion Astrophysical Observatory, at Victoria, B. C., was completed in 1918. By common consent Plaskett was appointed Director. He began his new duties while his eldest son was still serving with the Canadian forces overseas, selected a staff of competent assistants, and initiated a program of observation of radial velocities of fainter stars which is still being successfully continued. His eminence in this field of investigation was recognized by his selection by the International Astronomical Union as the Chairman of its committee on radial velocities, for many years. Attention was at first concentrated on spectroscopic binaries, resulting, *inter alia*, in the discovery of the very massive pair BD $+ 6^\circ$ .1309, each of whose components has almost 100 times the mass of the sun, which is generally known as "Plaskett's star." Later, when the theory of galactic rotation had been developed, an extensive program of study was developed by Plaskett and J. A. Pearce, whose results, published in a series of important papers, form a major contribution to the problem.

One result of general interest was that the sharp lines of calcium, which appear in the spectra of these stars, showed, on the

average, one-half as great a rotation-effect as the diffuse stellar lines. This affords a direct proof that the sharp lines are really interstellar, produced by absorption by atoms scattered through space, and on the average at half the distance of the star.

After his retirement from the directorship in 1935, Plaskett served as a consultant, notably in the figuring and testing of the 82-inch mirror of the McDonald Observatory. One of his last scientific contributions was the report on this work, presented at the dedication of this Observatory. Failing health at last interrupted these activities, and he died at his home in Esquimault, British Columbia, on October 17, 1941.

His astrophysical work brought him wide and well-earned recognition, honorary degrees from the Universities of Pittsburgh, Toronto, British Columbia, McGill, and Queens, the Gold Medal of the Royal Astronomical Society, the Rumford Medal of the American Academy of Arts and Sciences, the Bruce Medal of the Astronomical Society of the Pacific, the Henry Draper Medal of the National Academy of Sciences, and the Flavelle Medal of the Royal Astronomical Society of Canada. He was elected a Fellow of the Royal Society in 1923, and a member of the American Philosophical Society in 1930, and was made a Commander of the Order of the British Empire in 1935.

He was characterized personally by geniality, tact, and good-humor, which made him many friends, and by a direct and wholesome simplicity of life, combined with sincere religious belief, which endeared him to those who knew him well. His wife, the devoted partner of his early struggle and his later success, survives him, as do two sons, one of whom carries on his father's tradition as Savilian Professor of Astronomy at Oxford.

Henry Norris Russell

JESSE SIDDALL REEVES

(1872–1942)

Jesse Siddall Reeves was born at Richmond, Indiana, January 27, 1872, and died on July 7, 1942, at Ann Arbor, Michigan, where he had resided since 1910. He was graduated from Amherst in 1891 and took his Ph.D. at Hopkins in 1894. It was originally his intention to practice law, and in 1897 upon his admission to the Indiana Bar he hung out his shingle in his home town. Business

was not so engrossing, however, as to prevent his returning to the Hopkins in 1905–6 to lecture in diplomatic history, an experience which appears to have determined his final choice of a profession. In 1907 he accepted a post in Political Science at Dartmouth, and three years later he became Professor of that subject at the University of Michigan and Chairman of the recently established Department of Political Science. In 1931 he became the first appointee to the William Wheeler Cook Professorship of American Institutions at Michigan.

Although Jesse Reeves was a scholar of wide-ranging interests which embraced music, art, literature, and general history, the most fruitful of his studies converged upon the subjects of diplomatic history and international law, in which he was an outstanding authority. From 1920 to 1930 he was a member of the board of advisers of the Institute of Politics at Williamstown, Massachusetts, and served as a Round Table leader. In 1924 he lectured before the Academy of International Law at The Hague, and from 1925 to 1927 was a member of the Pan-American Commission of Jurists for the codification of international law. In 1926 he delivered the James Schouler Lectures in History and Political Science at Hopkins. He was a member of the Institut de Droit International, of the American Institute of International Law, the American Society of International Law, the American Historical Association, the American Political Science Association (of which he was President in 1928), the Research Club of the University of Michigan. In 1926 he received the honorary degree of Doctor of Humane Letters from his alma mater and in 1933 the degree of Doctor of Letters from Williams College. In 1932 he was named Henry Russel Lecturer at the University of Michigan. He was elected a member of the American Philosophical Society in 1934.

His publications, besides numerous essays and reviews, included *International Beginnings of the Congo Free State* (1894); *Napoleonic Exiles in America* (1895); *American Diplomacy under Tyler and Polk* (1907); and *La Communauté Internationale* (1925). He aided in preparing an edition of Grotius' works, and had at the time of his death collected a great mass of material, much of it drawn from widely scattered and recondite sources, for a book on Prester John.

On account of his strong common sense and his power in speaking, Reeves exerted great influence in academic counsels. Nor did

he confine his usefulness to the academic sphere. During the first World War he was commissioned captain in the Air Service, and later was promoted to the rank of major and judge advocate of the 20th Division. He received his honorable discharge from the Army on December 23, 1918.

A brusque manner and a, at times, biting wit, concealed in Reeves, till one knew him better, a generous and justice-loving nature which was always ready to level a lance at spurious claims or to champion a just cause. His hold upon the esteem and affections of his students was notable. The last time he met his class in Political Thought in June 1941, he was presented with the following tribute:

> The ending of this semester marks the valedictory of a scholar and teacher in Michigan's finest tradition. University courses have, in general, two potentialities: they may furnish the knowledge of the subject matter as such, or they may transmit to the student a technique and approach that may be applied to future problems. It is seldom that both these potentialities are realized, but we feel that Professor Reeves has succeeded in passing beyond the confines of each category. His fund of scholarship has been supplemented and enhanced by the spirit of fair-dealing that pervades his philosophy, and it is in this respect particularly that he will exercise a lasting influence on his students.

EDWARD S. CORWIN

GEORGE ANDREW REISNER

(1867–1942)

George Andrew Reisner was born in Indianapolis on November 5, 1867, the grandson of one of Napoleon's German soldiers. His mind was as completely thorough and painstaking as that of any of his grandfather's countrymen, but something was in his veins which came from the west as well. He went to high school in Indianapolis and afterwards to Harvard College. When he graduated in 1889 his family wanted to make a lawyer of him, but they did not get very far, for after a year he was back in Cambridge, supporting himself by tutoring and working for the Ph.D., which he took in 1893. He taught in Harvard in 1896 very briefly and returned at rare intervals for short periods on several other occasions, but actually he was fated to live and work for almost half a century abroad.

After he had taken his doctorate he went to Germany on a travelling fellowship and at Göttingen continued the Assyriology which he had chosen as his lifework, and as a second subject he took up Egyptology under Adolf Erman in Berlin. Everybody seems not only to have admired, but they all appear to have adored Erman, and young Reisner fell under his spell. Very little cuneiform came from his pen, for Egypt had got under his skin—perhaps because of its own fascination, but probably largely because of the charm of Erman. The latter unquestionably had a good deal to do with his appointment to the post of Assistant in the Egyptian Department in the Berlin Museum, and Reisner's future lay on the Nile instead of the Tigris as he had expected. Those were the days of the first volumes of the great catalogue of the Cairo Museum, and Reisner—who at that time was probably looked on as being a German as much as an American—went to Egypt in 1897 to join the other Germans, the Frenchmen and a few Englishmen, and was given the amulets and the models of ships and boats to catalogue. While he was in the Museum he wrote a short but brilliant article on the history of the canopic jars which appeared in 1899.

It was in the same year that the fabulously rich Mrs. Phoebe Hearst of California took the usual trip up the Nile. The new Museum in Cairo and the busily working students there filled her imagination with what might be done for her own state nearly half way round the world, and luckier than most would-be patrons of science, she found the young Dr. Reisner on the spot to make her dreams come true. The arrangement was for five years and Reisner started in to dig at Ḳuft in Upper Egypt, moving the next year on to Naga' ed Deir and being joined by Albert M. Lythgoe, an American from the School in Athens, and Arthur C. Mace, an Englishman from the digging staff of Petrie. The new site was a sort of archaeologist's dream. No one had been there before them and the cemeteries, though small and provincial, went all the way from the prehistoric period to Christianity, and Reisner, Mace, and Lythgoe had enough to keep them busy for several years.

From all three of them I used to hear remarkable tales, and they were not all archaeological. Reisner's one child was born in Germany one summer and he could not leave when word came of Egypt's last great cholera epidemic. Mace was telegraphed for in England to go out in Reisner's place to look after the camp in the panic which followed, and it was typical of Reisner that the men

already were so fond of him that Mahmūd el Mayet, the head man, showed Mace how the dead were being buried at night so that the living might escape the quarantine which otherwise would have been put upon them. And other things showed that Reisner's relations with his men were extraordinarily good. In the first place, he spoke and wrote Arabic excellently, and in the second, he was always deeply interested in the affairs of the men and more than sympathetic with them in their ills. Many an Arab spent his entire lifetime working with him and not only did they do all of his photography, but I understood that one boy wrote many of his scientific notes in Arabic for him as well. To what extent this last was true I do not know for certain, but I do know that years ago, when I was staying at the Gizeh camp, I saw a magnificent picture his camera boys had taken from the top of the Second Pyramid where they had lugged a heavy camera and tripod, up over the smooth cap stones to the peak, where few people have ever been.

In 1904 everything had a rosy hue. The Hearst expedition had weathered its first five years and Mrs. Hearst had launched it on a second period. The Hearst Medical Papyrus had been purchased from natives in Upper Egypt and to show how well he had mastered ancient Egyptian, Reisner had it well along on its way to publication, which it was to see in the course of the next year. Mace was still digging with Reisner, and though Lythgoe had left the California expedition to organize one for the Boston Museum it was with Reisner's blessing, with a number of Reisner's trained men and with a large part of his recently acquired concession at the Pyramids. Then came a blow which was to end all of their happy dreams. Mrs. Hearst had to withdraw her support suddenly and Reisner was left without a job.

I doubt whether the dropping of a bomb shell in the midst of a very happy family could have had any more devastating effects. Unfortunately Reisner told no one about what had happened until everything was fixed up at home for him to assume the direction of the Boston excavations which Lythgoe was conducting, and the quarrel which ensued extended to Mace as well. At about this period there must have been developed an intriguing streak in Reisner's makeup, for he rowed with many of his old cronies, and even after the first World War his feud with Breasted, who was then trying to reorganize the entire set-up of digging in Egypt, and with Howard Carter, when the latter was working in the tomb

of Tut-'ankh-Amūn, are not tales of Christian charity Those were hectic, hot-blooded days, but in later years his row with Breasted was made up and there was no one left alive with whom he was not on cordial terms.

In 1906, once Lythgoe and Mace had left the Pyramids and started the Metropolitan Museum work at Lisht, there began another great period of excavation by Reisner. At the Third Pyramid he discovered the extraordinary statues of King Mycerinos and succeeding years produced sculpture almost as remarkable from tombs on Gizeh plateau. To a few Egyptologists his name was already great, but from henceforth his reputation with the general public waxed greater and greater, year by year. It had been decided that the Aswan dam was enough of a success to justify its being raised, and the Egyptian Survey Department put him in charge of clearing the desert soon to be under water. He was given charge of an expedition sent by Harvard to Samaria and this he led with consummate skill, but I do not believe that his heart ever warmed up to work in Palestine the way it did in the Valley of the Nile. At this time he had four jobs: closing up the Hearst work, digging for the Boston Museum of Fine Arts and Harvard in Egypt, for the Survey Department in Nubia, and for Harvard in Palestine. And all that he touched was a success. There is no question but that Reisner was the greatest excavator of Egyptian antiquities then alive and both his luck and his judgment were phenomenal. A small, short dig at Bersheh, in Upper Egypt, produced a magnificent set of coffins for the Boston Museum, and the Sudan piled up some of the most extraordinary antiquities ever brought from the Nile Valley. No one can fail to be impressed by the late antiquities from Napata, including the now famous Greek rhyton signed by the painter Sotades, nor by the strange jewelry of the Nubian kings, but to me personally no more interesting find was ever made than the much earlier, gigantic grave tumulus of Hep-zefi raised by Sudanese slaves nearly two thousand years before Christ. Hep-zefi had died at his post way up the Nile and was buried with his negro servitors all about him in a land where human sacrifice was still a terrible sequel to the death of anyone of consequence.

Then in 1926 came what was perhaps the climax to the career, not only of a very lucky excavator, but of one whose brilliancy unerringly led him to antiquities which were unparalleled. The

tomb of Hetep-heres was near the pyramid of her son Cheops, a hundred foot deep pit which, as the men laboriously emptied it, required an elevator to plumb its unusual depth. When Reisner and his men finally got to the bottom they found a most extraordinary pile of litters and bed-canopies heaped around an empty sarcophagus. Slow, age-long decay had caused a terrific amount of damage to every perishable material, but Reisner's methodical and laborious work on it retrieved a most astounding lot of travelling equipment with which the mother of the builder of the Great Pyramid started her last and longest journey.

The furnishings of Queen Hetep-heres were by no means the last of Reisner's discoveries, but while he was a far wiser man, he was older, and even his limitless energy began imperceptibly to slow down. More and more he wanted to talk with his fellow-men and, of all things, he became one of the most assiduous attendants at the Cairo Rotary Club's luncheons. The first World War and the part played by Germany in it had brought him up short and when his original shock was over, he suddenly remembered that he was wholly an American, and he never was tempted to be a German-American again.

He had but few peers, and in recent years no betters in his chosen subject. One must admit that his written works are desperately difficult to read, and I always felt that when Newberry once said he had spent months excavating at Naga' ed Deir—by which he meant trying to study Reisner's books—it was not all a joke. Naga' ed Deir, the Gizeh pyramid temples and surrounding tombs, and the Sudan work at Meroë and Napata were all the subjects of his rather rare but always learned works. Some of his shorter articles which he probably regarded as far less important make infinitely better reading. He was elected a member of the American Philosophical Society in 1940.

The spring of 1939 marked the fiftieth anniversary of his graduation from Harvard, and Reisner made the long trip from Egypt back to Cambridge to receive the degree of Doctor of Letters. The years had become a burden by now. His eye-sight, which had never been good, was now definitely bad and scarcely survived this last, very brief one of his infrequent trips to the land of his birth. The second World War came upon him almost immediately. He insisted that his wife and daughter come back again to America, and he settled down to spend his last, scant three years almost alone

at his adored pyramids, working as long as his fast failing strength would allow him. Finally came the days when he was not only bed-ridden, but speechless and blind. He was taken to a hospital in Cairo, but in the end he had himself carried back to the pyramids and at last he died on June 6, 1942, aged 74.

George Andrew Reisner was without any doubt the greatest excavator and archaeologist the United States has ever produced in any field. All of his archaeological notes are to come to the Boston Museum of Fine Arts and they will be found to be prodigiously informative. To Harvard he has bequeathed 1300 volumes of detective stories.

H. E. Winlock

CHARLES SCHUCHERT

(1858–1942)

Charles Schuchert was born in Cincinnati, Ohio, July 3, 1858, and died in New Haven, Connecticut, November 20, 1942. His father, a Bavarian cabinet-maker, had established a furniture factory in Cincinnati and young Charles was slated for a business career until Fate took a hand.

His formal education was limited to six early years in parochial school followed by one in business school, during which he tried in vain to fit himself to be bookkeeper in his father's firm. At the age of fourteen he went to work as a laborer in the varnishing room; but qualities of leadership were soon evident and within a few years he had progressed from laborer to sales agent and finally to general manager. When fire swept the factory on the eve of a national financial depression in 1877, the blow left the father broken in spirit and in health; but Charles, then aged nineteen, kept the family together, managed to salvage about nine hundred dollars, and, single handed, began to rebuild the business. Within five years, success was again within his grasp, only to be snatched away by another disastrous fire, and thus, at the age of twenty-six, he found himself once more at the foot of the ladder, seeking employment as a factory workman.

But what seemed like a dungeon of despair turned out to be the portal to a bright new world. From childhood, Charles had been a naturalist at heart. The hills of Cincinnati abound in the fossil shells of animals that grew on an ancient sea floor, and in these he

found romance and excitement. He was eleven years old when he first saw a cabinet of fossils in the home of a local collector. Wide eyed with enchantment, he learned how and where such treasures could be found—and within the hour was off to the hills collecting fossils. This was a milestone in his life and thereafter, Sundays and holidays and such vacations as could be snatched from the factory were spent in this way. Brachiopods were his first love and he traded the rest of his collections to other local enthusiasts in exchange for his favorites. Thus, as an amateur, he had amassed a collection of brachiopods second to none in the Ohio Valley before he was twenty-six. Meanwhile, at the age of sixteen, he had chanced upon a ponderous technical tome that described and figured most of his treasures, and with this as his primer, he began his self education as a scientist.

During his late teens the search for fossils brought him the acquaintance of other young paleontologists, notably E. O. Ulrich, then Curator for the Cincinnati Society of Natural History. He and Ulrich were soon inseparable companions, collecting on Sundays, spending long evenings over their fossils, and building air-castles for the future. Schuchert had studied drawing in night high school during parts of two years and later learned the art of lithography, which he taught to Ulrich. The air-castles began to take on substance when Ulrich, in 1884, received a commission to prepare and illustrate paleontological works for the geological surveys of both Illinois and Minnesota, and Schuchert, whose business had just been swept away, became his assistant. Schuchert's duties were essentially manual, assorting and preparing the specimens and helping with the engraving, but he devoted the long evening hours to study of brachiopod literature. After three years with Ulrich he became assistant to James Hall, the leading paleontologist of his day, at Albany, where he fell under the stimulating influence of John M. Clarke and of Charles E. Beecher of Yale who made frequent visits to Albany. Here, too, his official duties were manual, but with singular devotion he burned the midnight oil in Hall's great library, extending his knowledge of fossils and of general geology. Later he was Assistant to N. H. Winchell at Minnesota and to C. D. Walcott at the United States Geological Survey, before becoming Assistant Curator of Invertebrate Paleontology at the United States National Museum in 1894. Ten years at this great institution gave him rich and varied experience in the

laboratory and in the field, and provided a stimulating environment for his further self-education.

In 1904 he was called to Yale as Curator of the Geological Collections in Peabody Museum of Natural History and Professor of Historical Geology. He was Chairman of the Geological Department at Yale from 1909 until 1921, served as Acting Dean of the Graduate School from 1914 to 1916, was a member of the Governing Board of the Sheffield Scientific School from 1904 to 1925, and Secretary of the Trustees of Peabody Museum from 1912 until 1923.

His retirement at the age of sixty-five was "not even the beginning of the end" for Professor Schuchert but an opportunity to apply the wisdom of his riper years to the varied researches in which he had long been engrossed. During his long life he made notable contributions to paleozoic stratigraphy and invertebrate paleontology and to many other fields of geology. His first scientific interest was in brachiopods, and his *Synopsis of American Fossil Brachiopoda,* published in 1897, established his position as one of the foremost students of this group. His *Index and bibliography of the genera and genotypes of Brachiopoda* (with C. M. LeVene), 1929, and *Brachiopod genera of the suborders Orthoidea and Pentameroidea* (with G. Arthur Cooper), 1931, prove that he never lessened his devotion to this first love nor lost his pre-eminence as a student of brachiopods.

His interest turned to paleogeography when he began to teach stratigraphy at Yale and was groping for aids in synthesizing the geologic record. Quickly perceiving the usefulness of this medium, he set to work with characteristic energy and concentration to devour the voluminous stratigraphic literature, seeking data for a series of maps of North America that would show the distribution of lands and seas throughout the geologic past in more detail than ever attempted before. His *Paleogeography of North America,* published in 1910, showed the possibilities of this new field. His maps, constantly revised and occasionally republished, have been widely copied and have served as a pattern for others. As the foremost student of paleogeography, he has left a distinct impress upon the geological literature of our times.

His last years were spent completing a great synthesis of the *Historical Geology of North America* to accompany, and to provide

the factual basis for, his final set of paleogeographic maps. The first volume of this work appeared in 1935, the second in January 1943, and the third was essentially complete in manuscript when he died.

When he appeared before his first class at Yale, he had never taken a formal course in geology, and he was already forty-six years of age. Yet, lacking the benefits of a college education, he still became a great teacher and one of the foremost scientists of Yale. To his graduate students he was both teacher and foster-father. Having learned the hard way, he had little patience with the dilettante, but for the boy with ambition and the will for hard work he was patient in guidance, wise in counsel, and never failing in inspiration and encouragement; and his generosity in financing field problems for needy students has probably had few parallels.

As a scientist he was singularly devoted to the quest for truth, regardless of its effects on his personal interests. He struck out boldly with new ideas, but he never defended a stand to save face. To his last days he retained a youthful enthusiasm that was almost naïve, and an openness of mind rarely seen in mature men.

Professor Schuchert received many honors and was a member of numerous learned societies both here and abroad. He was elected a member of the American Philosophical Society in 1913; he was a member of the National Academy of Sciences, and recipient of its Mary Clark Thompson Gold Medal for "the broad perspective, originality, faithfulness of detail, and stimulating philosophy of his contributions to historical geology, and for his outstanding accomplishments in the field of paleogeography"; he received the Hayden Gold Medal of the Academy of Natural Sciences in Philadelphia "in recognition of pre-eminent geologic researches." He was President of the Geological Society of America and recipient of its Penrose Gold Medal for "outstanding original contributions or achievements which mark a decided advance in the science of geology"; he was honorary correspondent or foreign member of eleven learned societies abroad; and received honorary degrees from New York University, Harvard and Yale Universities. "Surely few men have accomplished so much from so little."

CARL O. DUNBAR

JACOB GOULD SCHURMAN

(1854–1942)

Jacob Gould Schurman, the son of Robert and Lydia Schurman, was born in Prince Edward Island May 22, 1854. On the Canadian Gilchrist Scholarship he went to the University of London, where he received the degree of A.B. in 1877 and A.M. in 1878. During the latter year he studied in Paris and at the University of Edinburgh, and by winning the Hibbert Travelling Fellowship was able to continue his studies for two years more in Germany and Italy. Returning to America in 1880, he was Professor of Logic and English Literature in the Acadia and Dalhousie Colleges for the next six years. In 1884 he married Barbara Forrest Munro, a lady of rare charm, and of a social tact and competence so perfect and unobtrusive that it could not be distinguished from the generous and friendly nature that inspired it. In 1886 he was appointed Professor of Philosophy and Ethics at Cornell University, and from 1892 to 1920 he was President of that institution. His intelligent interest in public affairs and his wide acquaintance with prominent people won him many political and academic honors. He was President of the First Philippine Commission, and joint author of the report in four volumes presented by the Commission to Congress. He was elected a member of the American Philosophical Society in 1908. In 1912–13 he was the United States Minister to Greece; in 1914 the Stafford Little Lecturer at Princeton; and in 1915 the First Vice President of the New York State Constitutional Convention. Retiring from the Presidency of Cornell in 1920, he served as Minister Plenipotentiary of the United States to China from 1921 to 1925, and to Germany from 1925 to 1930. In 1931–32 he was Honorary Lecturer on International Relations at the Institute of Technology at Pasadena, California. He might then, at the age of seventy-eight, very well have sought rest and seclusion; but, with health still unimpaired and interest undiminished, he spent much of the next seven years travelling extensively in Europe, Asia, and Africa. He died at his home in Bedford Hills, New York, August 11, 1942.

Jacob Gould Schurman lived a long life and an active one, and attained in full measure the success which his qualities merited. He was above all a man of positive and downright mind and character. Life was to him essentially neither a comic nor a tragic

enigma, but a challenge to serious endeavor. Never greatly troubled by doubt, he enjoyed in a high degree the will to believe, and the conviction that what could be logically defended with adequate knowledge should determine one's conduct and opinion. A phenomenal memory gave him easy and immediate command of all that he knew. He wrote out his lectures and addresses easily, and then, after reading them over three or four times, delivered them virtually as written without reference to notes or manuscript. The outstanding quality of his mind was the ability to apprehend fully and clearly, as a whole and in all of its parts, any practical situation or system of ideas. Members of the Cornell Faculty and of the Board of Trustees were agreed that no man could present for discussion any situation, however delicate or complicated, with more clarity, brevity, and precision than President Schurman. These qualities account in large measure for the success he attained as a teacher and writer, a university president, and a public official.

As a teacher Jacob Gould Schurman was noted for his brilliant exposition of philosophical systems of thought. If he had no great talent for the critical examination of fundamental assumptions, he could effectively stimulate thought by disclosing the limitations of any set of ideas by comparing it with others not so limited. At Cornell University his success as a lecturer was immediate. Students crowded his class room, and members of the faculty and of the community attended his public addresses in large numbers, not merely because of the brilliance of his exposition, but also because, having definite and vigorously defended convictions of his own, he gave them something more positive than the insecurity of a suspended judgment. The ideas that interested him in these years are indicated by the books he published: *Kantian Ethics and the Ethics of Evolution*, 1881; *The Ethical Import of Darwinism*, 1888; *Belief in God*, 1890; *Ten Lectures on Ethics*, 1892; *Agnosticism and Religion*, 1896. His published writings also include: *A Generation of Cornell*, 1898, and *The Balkan Wars*, 1914.

It was, however, as President of Cornell University for twenty-eight years that Jacob Gould Schurman will be chiefly remembered. In his inaugural address in 1892 he advocated what was then the novel policy of obtaining substantial financial aid from the State Legislature. The principal result of this change of policy was the establishment of the State Veterinary College in 1894, and the State College of Agriculture in 1904, as state supported and autonomous

parts of the University. Less infallible in his judgment of men than in his grasp of affairs, President Schurman's hurried appointment of a successor to Dean Bailey as Dean of the Agricultural College was a mistake which for two years created a troubled situation. But he commonly left appointments to the several schools and departments, and he effectively maintained the Cornell tradition of department self government and of freedom of teaching and learning against interference from the trustees or the alumni. On one critical occasion, when he was under pressure from the alumni to dismiss a distinguished Cornell professor for statements made in a public address, President Schurman said to the Faculty: "I am interested in two things only: one is to preserve academic freedom; the other is that all cases concerning it should be settled by the Faculty." By sheer force of personality and intellectual mastery he dominated the trustees, and commonly won their support for his policies. His general policy was not to effect any radical changes, but to improve the quality and expand the activities of the University along the lines laid down by its founder, Ezra Cornell, and its first President, Andrew D. White. In this he was eminently successful; and it may be said with truth that during his administration Cornell University, judged by the distinction of its faculty and the quality of its instruction, came to rank with the best universities in the country.

In his official relations with the members of the faculty President Schurman sometimes failed in tact, and was sometimes thought to be, by those who did not know him well, a little abrupt, even at times a little arbitrary. It was in the manner rather than in the substance of his dealing that he was so. Too fully occupied to waste time, he was impatient with dullness and slow thinking; but he was never offended by intelligent opposition, he advised the faculty to magnify its office, and he was always scrupulous in according to others what he claimed for himself—the right of every man to form his own judgments and express his own opinion. In personal relations he was always cordial, courteous, and considerate; and in any small group of intelligent people he could be counted on to direct the conversation to matters of serious import, whether in the realm of ideas or of public affairs.

Jacob Gould Schurman exhibited in a high degree and in rare combination a talent for both the intellectual and the practical

activities. He was a professor of philosophy, the author of books on philosophy and ethics, a university president, a public official, and the diplomatic representative of his government to three countries over a period of eleven years. To all of these activities he brought tireless industry, wide knowledge, high intelligence, and complete integrity of purpose. In all of them he attained eminence. During his life time, both for what he did and for what he was, he won the respect and admiration of men. Both for what he did and for what he was he is worthy of remembrance.

CARL BECKER

PRESERVED SMITH

(1880–1941)

Preserved Smith, a son of the Reverend Doctor Henry Preserved Smith, a distinguished Old Testament scholar, was born in Cincinnati, Ohio, on July 22, 1880, and died in Louisville, Kentucky, on May 15, 1941. He prepared for college at Lawrenceville School and entered Amherst in 1897, graduating in 1901. He carried on graduate studies in history at Columbia University, where he received the degrees of A.M. 1902 and Ph.D. 1907. Dr. Smith was an Instructor in Political Science at Williams College, 1904–06, Amherst Fellow in History, 1907–14, Lecturer in History at Harvard University, 1919–20, and Professor of History at Cornell University, 1922–41. He was a member of Phi Beta Kappa, the American Society of Church History, and the American Historical Association. For a number of years he served as a valued member of the Board of Editors of the *American Historical Review,* to which journal he was a frequent contributor and a wise counsellor. Honorary doctorates were conferred on him by Amherst and Muhlenberg Colleges. He was elected a member of the American Philosophical Society in 1937.

While he was a graduate student at Columbia, Preserved Smith, under the guidance of James Harvey Robinson, began investigations in the field in which he became an outstanding authority, the history of the Reformation. For his doctoral dissertation he chose a difficult subject, a study of that confused mass of material known as Luther's Table Talk, and the monograph which he produced

was a sound piece of work that showed decided critical power. This was followed in 1911 by *The Life and Letters of Martin Luther,* a biography of the Reformer based upon a thorough knowledge of the important sources for his career and the extensive modern literature bearing on it. Two years later the Lutheran Publication Society brought out Dr. Smith's edition of some five hundred letters by or about Luther written between 1507 and 1521. These letters, translated and elucidated by the editor, constitute what is virtually a source book for the early years of the Lutheran movement. It was his intention to carry the correspondence on in later volumes to the end of Luther's life, but the project was not completed. *The Age of the Reformation,* his most comprehensive work so far, was published in 1920 and elicited high praise from competent critics for its qualities of scholarship and for its attractive style. *Erasmus: A Study of his Life, Ideals, and Place in History* appeared in 1923 and *A Key to the Colloquies of Erasmus* in 1927. In 1930 came the first volume of his most ambitious undertaking, *A History of Modern Culture.* He planned to devote four volumes to the subject, and the second volume was published in 1934, but the work, unfortunately, remains unfinished. It was conceived in the belief that science has given modern civilization its distinctive character. "Of all the elements of modern culture, as of all the forces moulding modern life," Dr. Smith wrote, "science has been the greatest." The first volume is a masterly survey of the century and a half that intervened between the publication of Copernicus' *De revolutionibus* and Newton's *Principia.* The social influences and effects of the growth of science were what he was principally interested in.

Preserved Smith's work was accomplished under the severe handicap of physical frailty and ill health long and patiently endured. His teaching, in which he was extremely conscientious, took more out of him than he could afford to give, yet he somehow found energy for the productive scholarship that was his life. His interpretation of history was largely determined by his attitude toward life, which was that of a rationalist and a liberal. As a scholar and as a man he exhibited in a rare degree the qualities of sweet reasonableness, tolerance, and devotion to truth.

Robert L. Schuyler

JOSIAH CHARLES, LORD STAMP

(1880–1941)

London experienced on April 16, 1941, one of its greatest air raids when every section of the city was damaged by incendiary bombs dropped for eight hours by enemy airplanes. Among the casualties of that night were Lord Josiah Stamp, his wife, and their eldest son, Sir Wilfred Stamp. This tragedy brought to an end the career of one of England's foremost economists and statesmen. He is missed not only by the British Empire, but by the United States and much of Continental Europe.

Josiah Charles Stamp was born in Bexley, Kent, on June 21, 1880, the son of Charles Stamp. His career as a public servant began early, when in 1896 he entered England's civil service as a member of the Inland Revenue Department, where he worked for fifteen shillings a week. In 1898 he was employed for the brief period of two years by the Board of Trade, after which he returned to the Inland Revenue Department, remaining there until 1914. During these years he attended London University, where he graduated in 1911, with First Class Honors.

His career with the government continued, and in 1914 he was transferred to the Secretariat. In 1916 he became Assistant Secretary of the Revenue Bureau, a position he held until 1919. During the First World War he was the chief financial adviser of Prime Minister Lloyd George.

From that time his work was not solely governmental. In fact, not until 1939, when the threat of war came to England, did he again for any extended period devote a major portion of his time to government service.

When Josiah Stamp was a member of the Inland Revenue Department, he had much to do with formulating tax legislation, particularly with that dealing with the excess profits tax, where he rendered especially valuable service. In 1919 he made his formal entry into business when he accepted a position as Secretary and Director of Nobel Industries, Ltd., a post he held until 1926. In 1927 and 1928 he was Director of the Imperial Chemical Industries, and from that time on he was connected with the London, Midland and Scottish Railway. At the time of his death he was Chairman of the Board of Directors.

Stamp became associated with the railroad business at a time when that industry was facing many serious problems—those, for example, of dwindling trade, competition from other means of transportation, rigid wage scales, and other high fixed costs. He tackled these difficulties with energy and a great organizing capacity.

This by no means concludes the story of Lord Stamp's career. One of his outstanding qualities was his boundless energy, a fact evidenced by the many responsibilities he took upon himself. He was a Lecturer in Economics from 1919 to 1921 at London University; in 1926 at Oxford; in 1927 at Cambridge; in 1931 at Manchester; in 1938 at Liverpool and at Dublin.

In 1924 he was the British representative on the Reparation Commission's (Dawes) Committee on German Currency and Finance. General Dawes is quoted as having said that the Dawes plan should have been called the Stamp plan, on account of the prominent rôle Stamp played in its formulation. In 1929 he was a member of the Young Experts' Committee. He had a deep and lasting interest in the problems of German reparations and the international problems to which they gave rise.

In 1925, Josiah Stamp took part, as a member of the Court of Inquiry, in settling the great coal mining industry dispute.

In 1931 he went to Canada to serve as Chairman of the Royal Commission to inquire into the effect on prices of trading in futures.

With the outbreak of the Second World War, Stamp naturally took a prominent part in the conduct of domestic affairs. He had been even before this time a Director of the Bank of England, and he retained this post until his death. He was a member of the Economic Advisory Council of England; Adviser on Economic Coordination to the Ministerial Committee; and a member of the War Transport Council, papers for meetings of which he had been studying the night of his death.

Stamp was a very public-spirited man and took an active part in many philanthropic enterprises. He had been President of the Library Association and of the Institute of Public Affairs, and Chairman of the Rockefeller Social Science Advisory Council.

He was an economist of first rank. He was President of the Royal Statistical Society from 1930 to 1932 and at his death an honorary Vice President. In 1936 he was President of the British

Association. He was an honorary member of the American Statistical Association, one-time Chairman of the London School of Economics, and an honorary member of the American Academy of Arts and Sciences. He was elected to membership in the American Philosophical Society in 1940.

Many honors were bestowed upon him. In 1938 the King raised him to the peerage, whereupon he became Baron of Shortlands. The King had previously awarded him C.B.E. (in 1918 for his work on war budgets), and later, K.B.E., G.B.E., and G.C.B. He received the Grand Cross with Star of the Austrian Order of Merit. These Universities conferred upon him honorary doctorate degrees: Oxford, Cambridge, London, St. Andrews, Edinburgh, Leeds, Dublin, Sydney, McGill, Toronto, Western Ontario, MacMaster, Lisbon, Athens, Harvard, Columbia, California, Northwestern, Johns Hopkins, Southwestern, Washington and Lee, Syracuse, and Duke.

Lord Stamp was a versatile and prolific writer. Books, articles, speeches, and lectures on a great variety of subjects poured from his pen. He is said to have been characterized thus by one of his associates in the Bank of England: "We have to let Stampy talk twice as fast as anyone else—he'd burst if we didn't." The following are among his important publications: *British Incomes and Property,* 1916; *The Fundamental Principles of Taxation in the Light of Modern Developments* (Newmarch Lectures for 1919), 1921; *Studies in Current Problems in Finance and Government,* 1924; *The Christian Ethic as an Economic Factor,* 1926; *Industrial and Railway Amalgamations,* 1928; *Some Economic Factors in Modern Life,* 1929; *Papers on Gold and the Price Level,* 1931; *The Financial Aftermath of War,* 1932; *Taxation during the War,* 1932; *The National Capital and Other Statistical Studies,* 1937; and *Practical Progress in Anglo-American Understanding* (Peterson Lecture, Town Hall, New York, 1938). He wrote the following as joint author with others: League of Nations, *Joint Report on Double Taxation,* 1923; A. L. Bowley, *The National Income, 1924,* 1927; Sir Arthur Salter and others, *The World's Economic Crisis and the Way of Escape,* 1932.

Lord Stamp's life is said to represent British Puritanism at its best. He married Olive Jessie Marsh in 1903. They had four sons, and their home life was an unusually happy one. He did not drink

nor smoke, but he never permitted his Puritanism to become unpleasant to other people. His innate modesty and keen sense of humor prevented that.

Much of Lord Stamp's material success may have come from the fact that he was both a man of theory and a man of practice. He had an unusual breadth of view and an essentially simple approach to his fellow men and to the conduct of affairs. The London *Times* called his career "a practical protest against the increasing specialization which many have come to regard as one of the banes of the modern age."

Lord Stamp was preeminently a kindly man. He had an incisive mind and a keen sense of human values. He was a man of amazing health and energy and of great intellectual power. His main concern, throughout his full life, was the furtherance of the common good.

E. W. Kemmerer

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